Guangzhou Sanjing Electric CO., LTD
17 Xiangshan Road
High and New Technology Zone
Guangzhou China 510663

Distributed by:
FENNEC Machinery
PO Box 2842
Carlingford NSW 2118

Phone: 02 9683-6117
Fax: 02 9630-9754
E-mail: info@fennecmachinery.com.au

INSTRUCTION MANUAL

- **Thanks for purchasing SAJ 8000 series VSD**
- **Upon receipt of the product and prior to initial operation, read this instruction manual thoroughly, and retain for future reference**

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PRECAUTION

Never modify the products. Failure to observe this warning can result in electrical shock or personal injury. SAJ is not responsible for any modification of the frequency products made by the user, since that will void your guarantee.

NOTES FOR SAFE OPERATION

Read this instruction manual thoroughly before installation, operation, maintenance or inspection of the frequency inverters. In this manual, safe operation are classified as "WARNING" or "CAUTION".

⚠WARNING

Indicate a potentially dangerous situation which, if not avoided, could result in death or serious injury to personnel.

⚠CAUTION

Indicate a potentially dangerous situation which, if not avoided, could result in minor or moderate injury and damage to equipment. It may also be used for warning against unsafe practices.

Even items described as ⚠CAUTION may result in a vital accident in some situations. Please follow these important notes:

NOTE **These are steps to be taken to ensure proper operation.**

BEFORE INSTALLATION

⚠ CAUTION

- Do not install or operate any frequency inverter that is damaged or has missing parts.
- Choose the motor of insulation class B or above. Otherwise it may cause an electrical shock.

INSTALLATION

⚠ WARNING

- Install the frequency inverter on nonflammable material like metal. Otherwise it may cause a fire.
- Make sure that the mounting environment away from metal dust. Otherwise it may cause damage to the frequency inverter.

⚠ CAUTION

- When mount over two inverters in the same cabinet or enclosure, install a fan or other cooling device to keep the temperature inside below 50 ℃.
- Do not let the conductor head or screws fall into the inside of the inverter. Otherwise it may cause damage to the inverter.

WIRING

⚠ WARNING

- Ensure only qualified personnel to operate. Otherwise it can cause an electrical shock.
- Make sure the inverter is isolated from power supply by the circuit breaker. Otherwise it may cause a fire.
- Verify that the power supply is turned OFF before start wiring. Otherwise it may cause an electrical shock or fire.
- Make sure that the ground terminal is grounded correctly. Otherwise it may cause an electrical shock.

⚠ CAUTION

- Never connect the AC power supply to output terminals U, V and W. Otherwise the inverter will be damaged and the guarantee is invalid.
- Make sure that wiring conform to EMC requirements and local power safe standard. Make sure to use right wire according to this instruction manual. Otherwise it may cause an accident.
- Braking resistor or braking unit cannot be directly connected to DC bus terminals (P+) and (N–). Otherwise it may cause a fire.

BEFORE TURN ON THE AC POWER SUPPLY

⚠ WARNING

- Make sure that the voltage of inverter conforms to the local power supply voltage. Verify that the wiring of input and output is correct and there is no short–circuit in peripheral circuit. Tighten the terminal screws. Otherwise these may cause damage to the inverter.
- Turn on the input AC power only after the front cover is put correctly. Otherwise it may cause an electrical shock.

⚠ CAUTION

- Never perform a hi–pot or withstand voltage test of the inverter. Otherwise it may cause damage to the inverter.
- Make sure that the optional parts are connected correctly. Otherwise it may cause damage to the inverter.

WHEN THE POWER IS ON

⚠ WARNING

- Do not open or remove the front cover when operation. Otherwise it may cause an electrical shock.
- Never touch the inverter and optional parts by wet hands. Never touch the connection terminals. Otherwise it may cause an electrical shock.
- When the power is on, the inverter will automatically check the power supply circuit. Do not touch U, V, W terminals and motor connection terminals. Otherwise it may cause an electrical shock.

⚠ CAUTION

- It is dangerous for the personnel to approach the motor and load during rotation of the motor. Do not change the factory parameters or settings unnecessarily. Otherwise it may cause a damage or injury.

OPERATION

⚠ WARNING

- When select the function of restart, do not approach the mechanical load. Otherwise it may cause an injury if it restarts suddenly.
- Do not touch the heat sink or discharging resistor. Otherwise it may cause harmful burns to the body.
- Never change or check signals if not a professional or qualified personnel. Otherwise it may cause damage and njury.

⚠ CAUTION

- Make sure nothing fall into the mechanical load or inverter. Otherwise it may cause damage.
- Start or stop inverter by corresponding buttons only. Otherwise it may cause damage.

MAINTENANCE

⚠ WARNING

- After the main circuit power supply is OFF, make sure the charge LED is OFF when maintain or inspect. Never maintain or inspect the inverter and mechanical load when the power supply is still ON. Otherwise it may cause damage and injury.
- Only qualified or authorized professional personnel can maintain, replace and inspect the inverter. Otherwise it may cause damage and injury.

NOTES FOR OTHER IMPORTANT OPERATIONS

⚠ CAUTION

1. Check Insulation of the Motor
   Check insulation of the motor and wire when the motor is used again after long time idle or for the first time. Disconnect the wire between the motor and the inverter before check insulation. Make sure the insulation resistor is not below 5M Ω .
2. Thermal Overload Protection of the Motor
   When the rated capacity of inverter is larger than that of the motor, install thermal overload relay for the motor or regulate the motor protection parameters of the inverter.

⚠ CAUTION

3. Consider the Bearing Capability of the Load

The inverter can provide output frequency from 0 Hz to 650 Hz. If the motor needs to work at over 50 Hz, user should consider the bearing capability of the load.

4. Avoid Mechanical Resonance Frequency

Regulate the skip frequency parameter of the inverter to avoid mechanical resonance frequency of the load.

5. Prohibition of Installation of Phase Advancing Capacitor

If a phase advancing capacitor or surge suppressor is connected in order to improve the power factor, it may become overheated and damaged by inverter high harmonic components. Also, the inverter may malfunction because of over current.

6. Installation of Magnetic Contactor

If a magnetic contactor is installed at the power supply side, do not use it to control the start of the inverter. If necessary, the time span should be one hour or above. Otherwise frequent switching may cause the inverter to malfunction.

If a magnetic contactor is installed between the output terminals and motor (output side of the inverter), make sure there is no output of inverter before switch on and off. Otherwise it may cause damage to the inverter.

7. Allowable Voltage Range and Power Supply Phase

Make sure the inverter works under allowable voltage range. If necessary, use boosting transformer or step–down transformer to change the voltage of power supply. Never change the 3–phase of inverter into 2–phase. Otherwise it will cause damage to the inverter.

8. Thunder Stroke Protection

Even there is protection device to protect the inverter from induction thunder stroke, it's necessary for users in frequent thunder stroke area to install other protective device.

⚠ CAUTION

9. Altitude and Degradation Use

At an altitude of 1000m or above, it could be better that use the motor with lower rated capacity. Otherwise the inverter may become overheated because of rare air. For example, in order to control the motor of 4KW rated capacity, it could be better to use 5.5KW inverter.

10. Dispose of Scrap Inverter

The scrap capacitor of main circuit and PCB (printed–circuit board) may explode when it is burned. In order to protect the environment, do not burn waste plastic parts and scrap capacitor.

11. Choose the Right Matching Inverter for the Motor

The standard matching motor is 4–pole inductive motor. If not, choose the right matching inverter according to the rated current of the motor.

According to the actual working situation of the motor, the factory setting of motor standard parameter can be revised. Otherwise it may cause low efficiency to the unit.

1 SELECT THE RIGHT TYPE

1.1 SPECIFICATIONS FORM

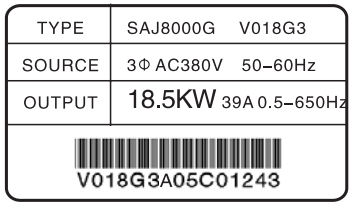
Item		Specification
Inverter Capacity Range		0.4KW~750KW
International Protection (IP) Class		IP20
Cooling Method		Forced air cooling, natural cooling
Basic Functions		Speed tracing, PID control, auto speed compensation, AVR, torque control, overlay control, time control, multi-speed choice, etc.
Power Supply	Rated Input Voltage and Frequency	Single phase: 220V; 3-phase:380V/460V/660V; 50/60Hz
	Allowable Voltage Fluctuation	±20%
	Allowable Frequency Fluctuation	±5%
Output Characteristics	Output Voltage	3-phase:220V/380V/460V/660V (Proportional to input voltage)
	Rated Output Frequency	Up to 650 Hz available by programming
	Rated Output Current	From 2.5A to 920A, according to different application
Control Characteristics	Control Method	1. Vector Control 2. V/F Control 3. Constant Torque or Power Control
	Frequency Accuracy	Digital command: ±0.01% (controlled by the keyboard of the inverter)
		Analog command: ±0.1%
	Frequency Resolution	Digital operator reference: 0.01Hz
		Analog reference: 0.1Hz
	Brake Unit (accessory)	Standard accessory inside for inverter capacity: 15KW and below
		Optional accessory for inverter capacity: 18.5KW and over
	Acceleration/Deceleration time of DC Braking	0.0 to 6553 second (Accel/Decel time setting independently)
	Braking Voltage	Adjustable range: 5%~30%
	Braking Frequency	Allowable brake range: 0.5~50Hz
	Braking Time	Adjustable range: 0.0~25.0 second
	Torque Compensation	0~6% under lower frequency
	Wiring Distance Between Inverter and Motor	Less than 50 meters (must add reactor when over 50m)
Protective Functions	Overload Capacity	G/Z/Y/M/S type: 150% of rated output current for 1 minute
		F/P type: 120% of rated output current for 1 minute
	Instantaneous Overcurrent	G/Z/Y/M/S type: Motor coasts to a stop at approx. 200% of rated output current.
		F/P type: Motor coasts to a stop at approx. 150% of rated output current.
	Heatsink Overheat	Protected by thermistor and motor coasts to a stop when temperature rises to 80℃.
	Others	Short circuit, undervoltage, overvoltage, lack of phase

Item		Specification
Control Signal	Analog Input	0~5V or 10V, 0~20mA (Z type: 0~1A, 0~5V or 10V)
	Analog Output	PWM signal output after filtering, pulse output up to 10V by setting
	Digital Input	Six group of input terminals covering 99 functions for choice
	Digital Output	Two group of programmable open-loop output and one group of programmable relay output covering 93 functions for choice.
Communication Interface	RS-485 Interface	Control the motor up to 99 units by one inverter
Display Function	Output current, input / output power capacity, power factor / coefficient, time, etc.	
Environment	Ambient Temperature	-10℃~50℃ (keep out of direct sunlight)
	Humidity	90% RH or less
	Location	Indoor (protected from corrosive gases and dust)
	Elevation	1000m or less
	Vibration	0.5G or less

1.2 RATED OUTPUT CURRENT FORM

Inverter Rated Output Capacity (KW)	Single Phase	3-Phase		
	220V	220V(240V)	380V (415V)	380V (440V)
	Rated Output Current (Amp)	Rated Output Current (Amp)	Rated Output Current (Amp)	Rated Output Current (Amp)
0.4	2.5	2.5	–	–
0.75	4	4	2.5	2.5
1.5	7	7	3.7	3.7
2.2	10	10	5	5
4	16	16	9	8
5.5	20	20	13	11
7.5	30	30	16	15
11	42	42	25	22
15	55	55	32	27
18.5	–	70	38	34
22	–	80	45	40
30	–	110	60	55
37	–	130	75	65
45	–	160	90	80
55	–	200	110	100
75	–	260	150	130
93	–	320	170	147
110	–	380	210	180
132	–	420	250	216
160	–	550	300	259
187	–	600	340	300
200	–	660	380	328
220	–	720	415	358
250	–	–	470	400
280	–	–	520	449
315	–	–	600	516
355	–	–	640	570
400	–	–	750	650
500	–	–	920	800

1.3 DESCRIPTION OF NAMEPLATE



Type: V 018R5 G 3 A05C01243 B

- B → Braking Unit
- A05C01243 → Serial Number of Production
- 3 → Voltage Class (3 is 3-phase/380V, 2 is 3-phase/220V, 1 is single phase/220V)
- G → Type of Frequency Inverter (G is General Type)
- 018R5 → Power Capacity of Frequency Inverter (018R5 is 18.5KW)
- V → Series Number (V is 8000 series)

2 INSTALLATION

2.1 STORAGE

⚠ CAUTION

- If not in use, do not open the outside package and put it on the goods shelf.
- Store the inverter in dry place without dust, corrosive gas and liquid.
- Storage temperature range: –20℃ to 65℃.
- Humidity: 95%RH or less without dew condensation.
- If the unused time is too long, make sure the inverter power on for at least one time within half of year. The time of power on must be over 5 hours. The input voltage of power supply must coast to rated voltage by boosting transformer.

2.2 INSTALLATION ENVIRONMENT REQUIREMENTS

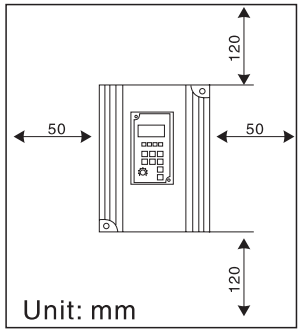
⚠ CAUTION

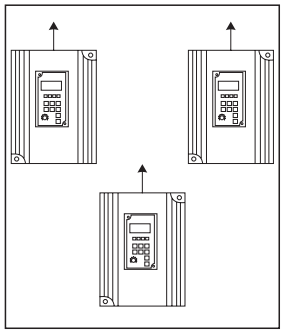
- Ambient temperature: –5℃ to 40℃, well ventilated.
- No water dripping. Avoid direct sunlight and low air pressure.
- No corrosive gas or liquid. No oil gas or metal dust.
- Installed indoors without vibration. Easy to maintain and inspect.
- Avoid electromagnetic interference.

2.3 INSTALLATION SPACE AND SITUATION

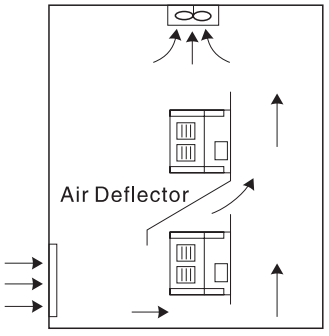
- In order to maintain conveniently, make sure there is plenty of space for inverter.
- In order to keep good cooling effect, install the inverter uprightly and keep well ventilated.
- If it is difficult to fasten the inverter, put a plat plate under the bottom of it. Otherwise the stress caused by getting-loose may cause damage to the main circuit components.
- Use nonflammable material like iron plate on the side wall of I installation.
- If there are multiple inverters installed in the same cabinet, keep the distance between them and add air deflector to ventilate the space.

Safety Space for Single Inverter Installation





Up–down Installation



Install Air Deflector

Notice: If the inverter is installed in the (power) cabinet, install fans for heat dissipation.

Figure2.1 Installation of Multiple Inverters

3 WIRING

⚠ WARNING

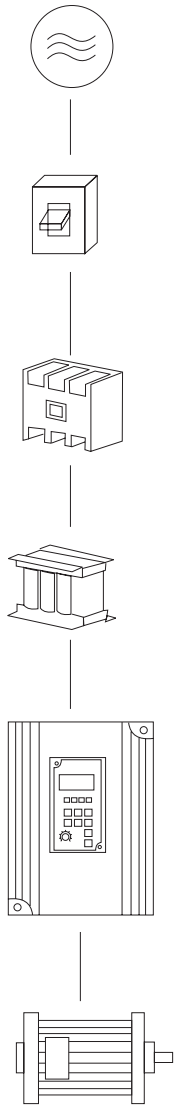
- Ensure only qualified personnel to operate. Otherwise it can cause an electrical shock.
- Make sure the inverter is isolated from power supply by the circuit breaker. Otherwise it may cause a fire.
- Verify that the power supply is turned OFF before start wiring. Otherwise it may cause an electrical shock or fire.
- Make sure that the ground terminal is grounded correctly. Otherwise it may cause an electrical shock.
- Make sure that the voltage of inverter conforms to the local power supply voltage. Verify that the wiring of input and output is correct and there is no short–circuit in peripheral circuit. Tighten the terminal screws. Otherwise these may cause damage to the inverter.

⚠ CAUTION

- Never connect the AC power supply to output terminals U, V and W. Otherwise the inverter will be damaged and the guarantee is invalid.
- Make sure that wiring conform to EMC requirements and local power safe standard. Make sure to use right wire according to this instruction manual. Otherwise it may cause an accident.
- Braking resistor or braking unit cannot be directly connected to DC bus terminals (P+) and (N–). Otherwise it may cause a fire.

3.1 MAIN CIRCUIT WIRING

(1) Main Circuit Wiring Diagram



Power Supply: Make sure that the voltage of inverter conforms to the local power supply voltage.

Circuit Breaker: If use ELCB (Earth Leakage Circuit Breaker), choose the type which can protect it from harmonic wave. If use MCCB(Mold Case Circuit Breaker), please refer to **section 3.5.5** on page 26.

Magnetic Contactor: Do not use magnetic contactor as the switch of the inverter. Otherwise frequent switching may cause the inverter to malfunction.

AC Reactor: When connecting an inverter to a large capacity power supply transformer, or when switching a phase advancing capacitor, excessive peak current flows in the input power supply circuit, which may damage the inverter section. In such cases, install a DC reactor (optional) between inverter P1 and P2 terminals or an AC reactor (optional) on the input side.
Installation of a reactor is effective for improvement of power factor on the power supply side.

Inverter: Make sure the wiring of main circuit and signal control is correct.

Motor

Figure 3.1 Main Circuit Wiring Diagram

3.2 TERMINAL INDICATION

3.2.1 Main Circuit Terminals

Terminal Symbol	Function Description
R, S, T	Terminals of 3-phase AC input. For 220V AC input, use terminals R and T
U, V, W	Terminals of 3-phase AC output
P, PB	Spare terminals of braking resistor
E	Ground terminal
P1, P2	Spare terminals of DC reactor
P, N	Spare terminals of braking unit. For inverter of 75kw~315kw, if need braking unit, select terminals P1 and N.

Figure 3.2 4KW-15KW

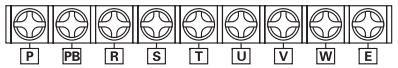


Figure 3.3 18.5KW-55KW

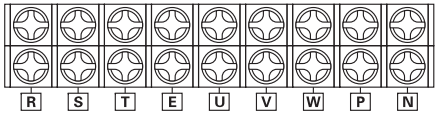
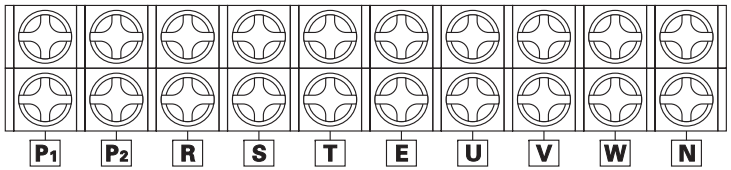


Figure 3.4 75KW-315KW



3.2.2 Control Circuit Terminals

Figure 3.5 Control Circuit Terminals (4KW~7.5KW)

A	B	C	D	10V	ACM	FM	VI	CI	DI	RST	MI1	MI2	MI3	MI4	FWD	REV	MO1	24V	DCM

Figure 3.6 Control Circuit Terminals (11KW and above)

A	B	C	D	P+	P-	F+	F-	10V	ACM	FM	VI	CI	DI	RST	MI1	MI2	MI3	MI4	FWD	REV	MO1	24V	DCM

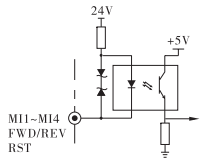
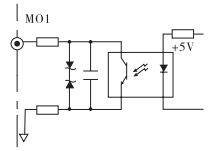
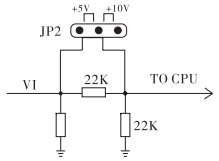
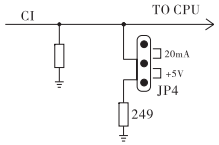
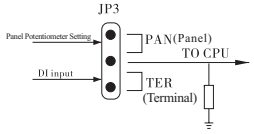
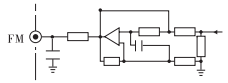
Figure 3.7 Control Circuit Terminals (M series type)

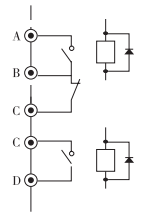
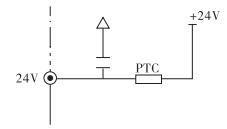
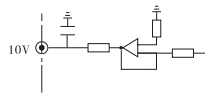
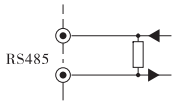
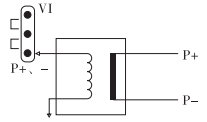
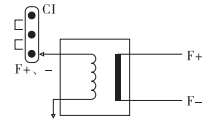
A	B	C	10V	AM	VI	CI	RST	MI1	MI2	MI4	FWD	REV	MO1	DCM

Notice:

- **For M series type, control circuit terminals can be changed according the requirements of customer.**
- **For M series type, the function of terminal AM is the same with terminal FM.**

3.2.3 Control Circuit Terminals Functions and Specifications

Terminal Symbol	Function	Description	Circuit Diagram
FWD	Forward-Stop Command	ON:Forward Run OFF:Decelerate to Stop	
REV	Reverse-Stop Command	ON:Reversal Run OFF:Decelerate to Stop	
RST	Reset	ON:Reset to Stop	
MI1	Multi-function Input 1	Refer to Parameter of F041~F044	
MI2	Multi-function Input 2		
MI3	Multi-function Input 3		
MI4	Multi-function Input 4		
M01	Multi-function Output Common Terminal	Common for Multi-function Outputs. Max 48Vdc 50mA	
VI	Analog Voltage Input (Factory Setting:10V)	Select 0~5V Input or 0~10V Input by Jp2 (Jumper2)	
CI	Analog Current Input (Factory Setting:20mA)	Select 0~5V Input or 0~20mA Input by Jp4	
DI	Analog Voltage Input (FactorySetting : PAN (Panel Potentiometer Setting))	Select 0~5V Input or Panel Potentiometer Setting by Jp3	
FM	Analog Voltage Output	Analog Voltage Output: 0~10V	

Terminal Symbol	Function	Description	Circuit Diagram
A	Multi-function Relay Output	Refer to Parameter F047. A-B:Normal Open(N.O.) B-C:Normal Close(N.C.) C-D:Normal Open(N.O.)	
B			
C			
D			
24V	DC Voltage Source	24VDC-100mA	
DCM	Digital Signal Common Terminals		
10V	Potentionmeter Power Supply for Frequency Setting	10V DC ,Maxi.10mA	
ACM	Analog Control Signal (Common Terminals)		
RS485	Standard RS485 Communication Signal		
P+	Analog Voltage Input 0~12V for Molding Injection Machine	Select P+,P- or VI by Jp6	
P-			
F+	Analog Current Input 0~1A for Molding Injection Machine	Select F+,F- or CI by Jp5	
F-			

Notice: The usual model of inverter doesn't have P+, P-, F+, F- terminals.

3.3 JUMPER ON CONTROL BOARD

Jumper	Description
JP1	Connect 1 and 2: disconnect terminal resistor Connect 2 and 3: connect terminal resistor
JP2	Select Analog Voltage Input 0~10V: choose VI terminal and switch JP2 to 10V Select Analog Voltage Input 0~5V: choose VI terminal and switch JP2 to 5V
JP3	Select Panel Potentiometer (PAN): switch JP3 to PAN Select Analog Voltage Input 0~5V: choose DI terminal and switch JP3 to TER (terminal)
JP4	Select Analog Voltage Input 0~5V: choose CI terminal and switch JP4 to 5V Select Analog Current Input 0~20mA: choose CI terminal and switch JP4 to 20mA
JP5	Connect 1 and 2: analog current input by terminal F+ and F- Connect 2 and 3: analog current input by switching to CI Factory Setting: analog current input by terminal CI
JP6	Connect 1 and 2: analog voltage input by switching to VI Connect 2 and 3: analog voltage input by terminal P+ and P- Factory Setting: analog voltage input by terminal VI

Figure 3.8 Jumper Diagram of 4KW~7.5KW

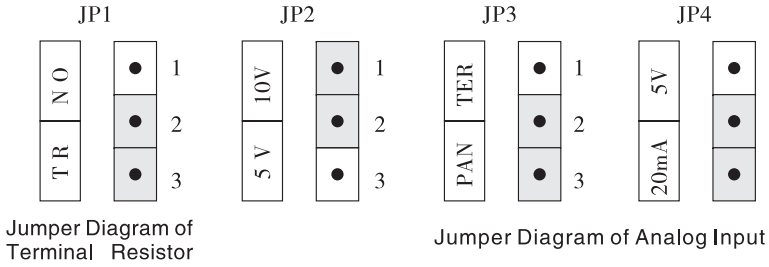


Figure 3.9 Jumper Diagram of 11KW and above

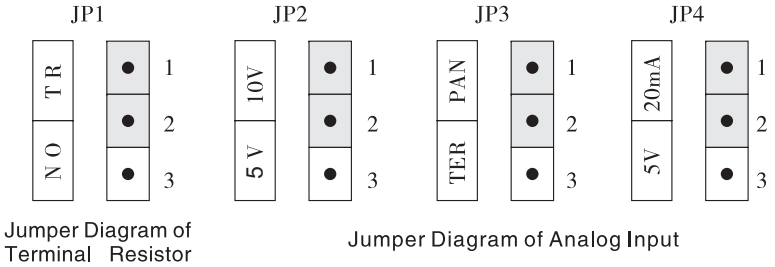
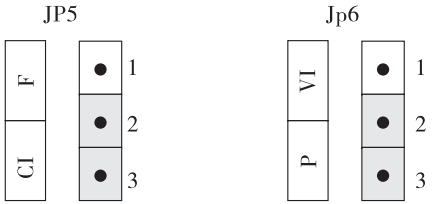


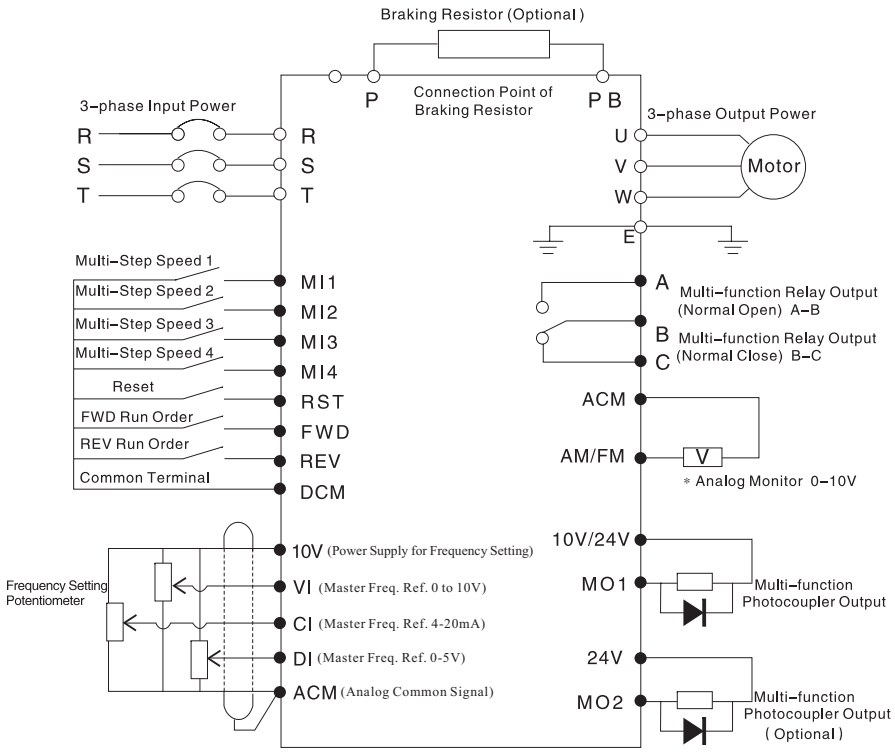
Figure 3.10 JP5 and JP6 Diagram for Molding Injection Machine



Notice: The usual model of inverter doesn't have P+, P-, F+, F- terminals.

3.4 WIRING DIAGRAM

Figure 3.11 Wiring Diagram



Notice:

- **Open the front cover of the inverter, user can find terminals of Main Circuit and Control Circuit.**
- **The usual model of inverter doesn't have the terminal function of C-D Normal Open. If necessary, make sure of this in your order.**

3.5 WIRING THE MAIN CIRCUIT

3.5.1 Wiring at Input Side of Main Circuit

3.5.1.1 Circuit Breaker

Make sure a circuit breaker is installed between AC power supply and input terminals (R, S, T). About the requirement of circuit breaker, please refer to **Specifications Form of Breaker, Cable and Contactor (3.5.5).**

3.5.1.2 Magnetic Contactor

Do not use magnetic contactor as the switch of the inverter. Otherwise frequent switching may cause the inverter to malfunction. Use it to cut off the input power supply when something is wrong in the system.

3.5.1.3 AC Reactor (Optional)

Installation of a reactor is effective for improvement of power factor on the power supply side. Also, it can protect the inverter from harmonic wave and peak current caused by large capacity load or transformer.

3.5.1.4 EMC Filter

The surrounding device may be disturbed by the cables when the inverter is working. EMC filter can minimize the interference and also protect inverter from such interference caused by other device.

3.5.1.5 DC Reactor (Optional)

DC reactor almost has the same function of AC reactor.

3.5.1.6 Braking Unit and Braking Resistor

• Inverter of 15KW and below has built-in braking unit in order to dissipate the regenerative energy generated by dynamic braking. The wire length of braking resistor should be less than 5m.

• External braking unit is connected for inverter of 18.5KW and above. The cable between inverter and braking unit should be less than 5m. The cable between braking unit and braking resistor should be less than 10m.

• The temperature of braking resistor will increase because the regenerative energy will be transformed to heat. Good ventilation is necessary.

3.5.2 Wiring Precautions for Main Circuit Output

• Shielded wire or wire tube is recommended for wiring. Make the both ends of wire tube or shielded wire to be grounded.

• It's necessary to install NFB (Non-fuse Breaker, MCCB is recommended) between input power supply and input terminals R, S and T.

• Never connect the input power supply to output terminals U, V and W. Otherwise the inverter will be damaged and invalidate the guarantee.

• Never touch the output circuit directly or put the output line in contact with the inverter case. Otherwise it may cause an electrical shock of grounding. In addition, never short circuit the output line.

• Never connect a phase advancing capacitor or LC/RC noise filter to the output circuit.

• Keep the distance between main circuit wire and other control devices.

• If the total wiring distance between inverter and motor is excessively long and the inverter carrier frequency is high, harmonic leakage current from the cable will adversely affect the inverter and peripheral devices. Thus reduce the inverter carrier frequency if the wiring distance between inverter and motor is too long.

• When the wiring distance between inverter and motor is over 15m (220V) or 30m (380V), it is better to install an AC reactor at the motor side of main circuit. Otherwise the motor insulation may be damaged and inverter may be tripped by over-current protection frequently because of the large leakage current resulted from the parasitic capacitance with ground.

3.5.3 Wiring Precautions for Control Circuit

• Use shielded or twisted-pair cables to connect control terminals.

• The cable connected to the control terminal should leave away from the main circuit and heavy current circuits (including power supply cable,

motor cable, relay and contactor connecting cable) at least 20cm and parallel wiring should be avoided. It is better to apply perpendicular wiring to prevent inverter malfunction caused by external interference.

• Connect the ground terminal (E) with shielded wire.

3.5.4 Grounding

• It is better to use copper wire (>3.5㎜²) as ground wires and keep the length as short as possible.

• Ground resistance: 200V class: 100Ω or less, 400V class: 10Ω or less.

• Never ground the inverter in common with welding machine, motor or other large-current electrical equipment.

• Run all the ground wires in a conduit separate from wires for large current electrical equipment.

• When using several inverters together, ground the units as shown in Figure 3.12 (a). Do not loop the ground wires as shown in (c).

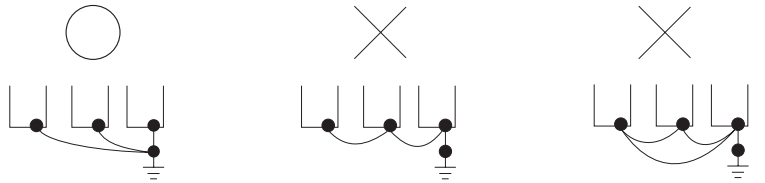


Figure 3.12 Grounding of Several Inverters

3.5.5 Specifications Form of Breaker, Cable and Contactor

Voltage	Inverter rated capacity (KW)	MCCB current (Amp.)	Magnetic Contactor Current (Amp.)	Input Cable (mm^2)	Output Cable (mm^2)	Control Circuit Cable (mm^2)
220V, Single phase	0.4	16	10	2.5	2.5	1.5
	0.75	16	10	2.5	2.5	1.5
	1.5	20	16	4	2.5	1.5
	2.2	32	20	6	4	1.5
380V, 3-phase	0.75	10	10	2.5	2.5	1.5
	1.5	16	10	2.5	2.5	1.5
	2.2	16	10	2.5	2.5	1.5
	3.7	25	16	4	4	1.5
	5.5	32	25	4	4	1.5
	7.5	40	32	4	4	1.5
	11	63	40	4	4	1.5
	15	63	40	6	6	1.5
	18.5	100	63	6	6	1.5
	22	100	63	10	10	1.5
	30	125	100	16	16	1.5
	37	160	100	16	16	1.5
	45	200	125	25	25	1.5
	55	200	125	35	35	1.5
	75	250	160	50	50	1.5
	93	250	160	70	70	1.5
	110	350	350	120	120	1.5
	132	400	400	150	150	1.5
	160	500	400	185	185	1.5

3.5.6 Specifications Form of Braking Resistor

Inverter Voltage Class	Inverter Capacity (KW)	Braking Resistor		Selection Condition
		Specification	Quantity	
220V,Single phase	0.4	80W/200Ω	1	125% braking torque, 10% usage rate
	0.75	100 W/200Ω	1	
	1.5	300 W/100Ω	1	
	2.2	300W/70Ω	1	
	3.7	300W/50Ω	1	
380V, 3-phase	0.75	80W/750Ω	1	
	1.5	300W/400Ω	1	
	2.2	300W/250Ω	1	
	4	400W/150Ω	1	
	5.5	500W/100Ω	1	
	7.5	1000W/75Ω	1	
	11	1000W/50Ω	1	
	15	1500W/40Ω	1	
	18.5	4800W/32Ω	1	
	22	4800W/27.2Ω	1	
	30	6000W/20Ω	1	
	37	9600W/16Ω	1	
	45	9600W/13.6Ω	1	
	55	12000W/20Ω	2	
	75	18000W/13.6Ω	2	
	93	18000W/20Ω	3	
	110	18000W/20Ω	3	
	132	24000W/20Ω	4	
	160	36000W/13.6	4	

Notice:

The above parameters are for reference only. It's better to use braking resistor or braking unit from SAJ factory. The distance between braking resistor and inverter should not be less than 10m. Otherwise it may cause damage to inverter.

4. OPERATION

4.1 KEYPAD DESCRIPTION

4.1.1 Keypad Schematic Diagram

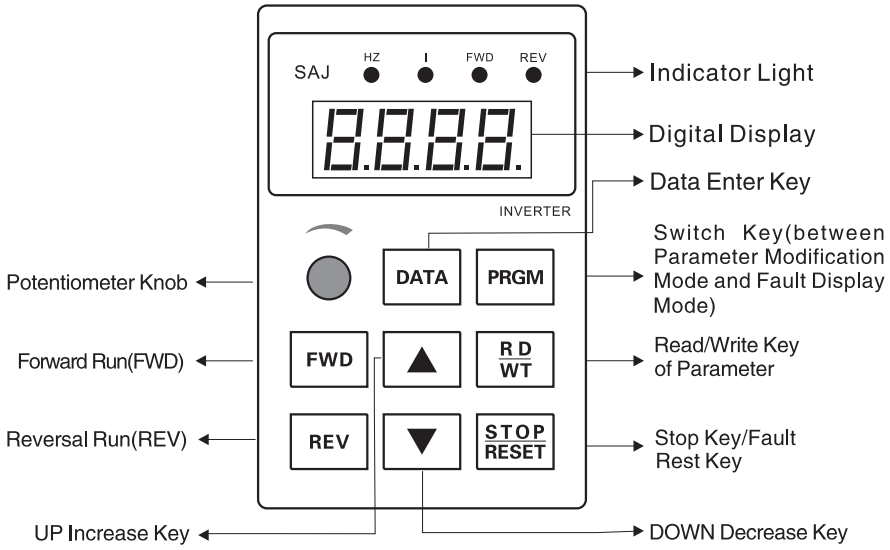


Figure 4.1 Keypad Schematic Diagram

4.1.2 Indicator Light Description

Function Indicator	Description
Hz	Light on: LED displays frequency data Extinguished: LED displays other unit data
I	Light on: LED displays current data Extinguished: LED displays other unit data
FWD	Light on: forward run Extinguished: stop run or reversal run
REV	Light on: reversal run Extinguished: stop run or forward run

4.1.3 Key Function Description under Different Mode

4.1.3.1 Control Mode

Key	Name	Function Description
FWD	FWD Run Key	Forward run control
REV	REV Run Key	Reversal run control
STOP RESET	Stop Key/Fault Rest Key	In running state, it can be used to stop the inverter. Under write in status, push this button to move the cursor on LED display.
RD/WT	Read/Write Key of Parameter	Read or write parameters.
▲	UP Increase Key	Progressively increase data or function codes
▼	DOWN Decrease Key	Progressively decrease data or function codes

Notice:

• Push DATA Key, select inverter operation mode between CONTROL MODE (CTRL Mode) and MONITOR MODE （MTR Mode）. If both LED lights of

Hz and I are extinguished, inverter operates under CTRL Mode. User can control the rotation direction of motor and modify the operation frequency.

• Under CTRL Mode, frequency setting by potentiometer is equal to terminal DI setting when Function Code F040=25.

• When the parameter of Function Code F040=8, user can push (▲ ▼) to change the running frequency.

4.1.3.2 Monitor Mode

Key	Name	Function Description
FWD	FWD Run Key	Forward run control
REV	REV Run Key	Reversal run control
STOP RESET	Stop Key/Fault Rest Key	In running state, it can be used to stop the inverter.
RD/WT	Read/Write Key of Parameter	Under MTR Mode, this key doesn't work.
▲	UP Increase Key	Select this key to display frequency data (Hz) or current data (I)
▼	DOWN Decrease Key	Select this key to display frequency data (Hz) or current data (I)

Notice:

• Push (DATA) Key, select inverter operation mode between CONTROL MODE (CTRL Mode) and MONITOR MODE （MTR Mode）. Under MTR Mode, if the LED light of Hz is on, frequency data is displayed. If the LED light of I is on, current data is displayed.

•By setting the parameter of Function Code F099, user can choose to display other data relative to LED light of Hz.

•By setting the parameter of Function Code F098, user can choose to display other data relative to LED light of I.

4.1.3.3 Parameter Modification Mode

Key	Name	Function Description
PRGM	PRGM Switch Key	Switch Key between Parameter Modification Mode and Fault Display Mode
STOP RESET	Stop Key/Fault Rest Key	In running state, it can be used to stop the inverter. Under write in status, push this button to move the cursor on LED display.
RD/WT	Read/Write Key of Parameter	Read or write parameters and function codes.
▲	UP Increase Key	Progressively increase data or function codes
▼	DOWN Decrease Key	Progressively decrease data or function codes

Notice:

• Push PRGM （ PRGM ） ， select inverter operation mode between Parameter Modification Mode and Fault Display Mode. If LED displays Fnnn (nnn is Function Code number), the inverter works under Parameter Modification Mode. Push (▲ ▼) to select Function Code and then push (RD/WT) to read the parameter of the Function Code. When the above steps are finished, push (▲ ▼) to modify the parameter and then push (RD/WT) to write in the parameter.

• If user wants to modify parameters of more Function Codes, repeat the above steps.

4.1.3.4 Fault Display Mode

Push PRGM （ PRGM ） ， select inverter operation mode between Parameter Modification Mode and Fault Display Mode. If LED displays 0.XX (XX is Fault Code), user can check the malfunction status or reset the inverter. Push (▲ ▼), can check malfunctions of the latest four times. Push STOP RESET, the inverter will be reset.

4.1.4 Keypad Operation Example: Steps of Modifying the Parameter of F002

Operation Step	LED Displays Data	Light Indication (both LED lights of Hz and I)
Before operation	0.0	Off
Push PRGM for one time	F000	On
Push ▲ to select F002	F002	On
Push RD/WT for one time (read)	10.0	On
Push ▼ to select 5.0	5.0	On
Push RD/WT for one time (write in)	5.0	On
Push DATA to get back to CTRL Mode	0.00	Off

4.2 QUICK START OPERATION INSTRUCTION

4.2.1 Reset

If the inverter is used for the first time or user cannot confirm the parameters of it, reset the inverter to initialize the parameters by the following two ways.

• Set Function Code F094=1, then push PRGM to select Fault Display Mode (LED displays 0.--). Then push STOP/RESET, the inverter will restore factory setting.

• After set Function Code F094=1, connect terminal RST to DCM. The inverter will restore factory setting.

4.2.2 Set Motor Parameters before Starting the Inverter

• Set V/F curve parameters. Please refer to F009, F010, F011, F015, F016 and F088 setting description on Function Code Table.

• Set rated current of the motor:

$$F078=\frac{\text{Rated current of motor}}{\text{Rated current of inverter}}\times 100\%$$

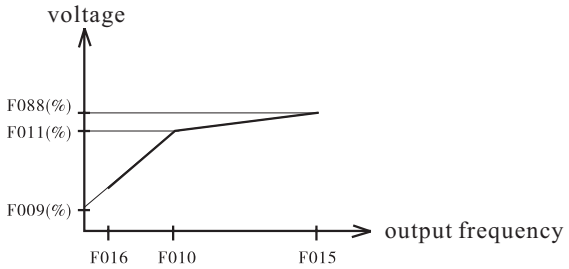


Figure 4.2 V/F curve diagram

4.2.3 Motor Parameter Autotuning

The procedure of motor parameter autotuning is as follows:

• Push PRGM to enter Parameter Modification Mode. And then input the following parameters according to the actual motor parameters:

F001: acceleration time

F002: deceleration time

F010: rated frequency of motor (factory setting: 50Hz)

F011: rated voltage % of motor (use % to define percent) (factory setting: 100%)

F015: upper limit frequency (must be greater than the frequency value of F010)

F068: vector voltage compensation, input 0.0

F078: rated current % of motor (use % to define percent) (factory setting: 100%)

F088: upper limit voltage % of motor (corresponding to the voltage under upper limit frequency)

• After the above parameters input are finished, set F094=155. And then push STOP/RESET to enter autotuning.

Notice:

• The motor should be uncoupled with its load. Otherwise the motor parameters obtained by autotuning may be not correct and it may cause malfunction of inverter.

• After autotuning, the following parameters will be set up according to the autotuning result:

F009: torque boost setting

F067: control mode selection

F068: vector voltage compensation coefficient

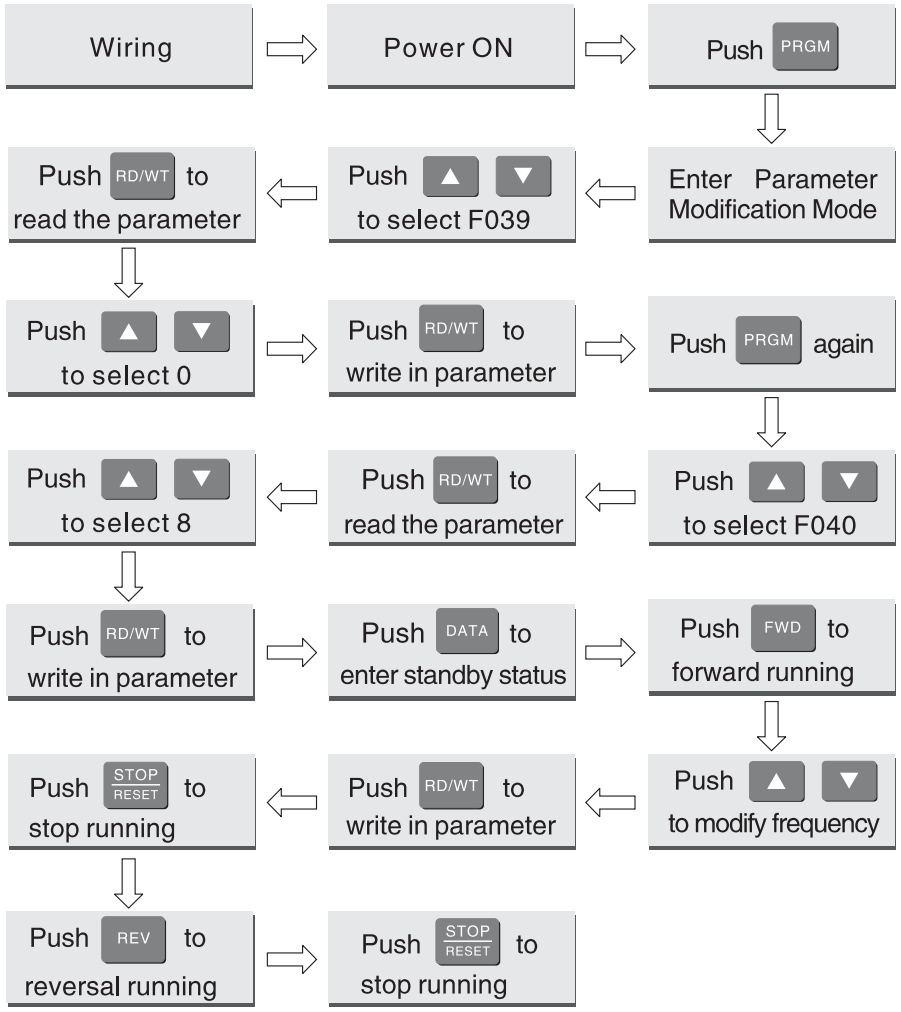
F069: vector frequency compensation coefficient

4.2.4 Inspect the Input Main Circuit

Make sure the wiring and power supply are OK, and then switch on the MCCB （Mold Case Circuit Breaker）. If inverter LED displays frequency value: 0.00, this means the initialization of inverter is success. If LED displays nothing, that means initialization failed. Switch off the MCCB, and then inspect the main circuit and inverter to find out the reason.

4.2.5 Keypad Operation Flow Chart

Keypad Operation Flow Chart: steps for frequency setting, forward run, reversal run, start and stop



5 DETAILED FUNCTION DESCRIPTION

5.1 FUNCTION CODE TABLE

Function Code	Name	Settings	Factory Settings	Type
F000	Master frequency setting	0.00Hz~650.00Hz	50.00Hz	R/W
F001	Acceleration time	0.1~6553.0 second	10.0 second	R/W
F002	Deceleration time	0.1~6553.0 second	10.0 second	R/W
F003	Input terminal FWD MI5 function selection	0~99	73	FR/W
F004	Input terminal REV MI6 function selection	0~99	74	FR/W
F005	Start-Point frequency for DC brake during stopping	0.50Hz~650.00Hz	5.0Hz	R/W
F006	DC brake voltage during stopping	0~30%	5%	R/W
F007	DC brake time during stopping	0.0~25.0 second	1.0 second	R/W
F008	DC brake delay time during stopping	0.0~1.0 second	0.5 second	R/W
F009	Torque boost setting	0~6%	3%	FR/W
F010	Motor rated frequency	0.50Hz~650.00Hz	50.00Hz	FR/W
F011	Motor rated voltage	30%~100%	100%	FR/W
F012	Carrier frequency	2.0~16.9KHz	Different according to the inverter type	FR/W
F013	Time distance between Modbus (RS485 port) LED letters display	3~250ms	3ms	FR/W
F014	Reserved			
F015	Upper limit frequency	0.50Hz~650.00Hz	50.00Hz	FR/W
F016	Lower limit frequency	0.00Hz~650.00Hz	1.00Hz	FR/W

Function Code	Name	Settings	Factory Settings	Type
F017	Skip frequency	0.00Hz~650.00Hz	0.00Hz	R/W
F018	Skip frequency bandwidth	0.00Hz~5.00Hz	0.00Hz	R/W
F019	Jog frequency	0.00Hz~650.00Hz	10.00Hz	R/W
F020	Jog acceleration/deceleration time	0.1~25.0 second	10.0 second	R/W
F021	Stage 1frequency	0.00Hz~650.00Hz	0.00Hz	R/W
F022	Stage 1 acceleration time	0.1~6553.0 second	10.0 second	R/W
F023	Stage 1 deceleration time	0.1~6553.0 second	10.0 second	R/W
F024	Stage 2 frequency	0.00Hz~650.00Hz	0.00Hz	R/W
F025	Stage 2 acceleration time	0.1~6553.0 second	10.0 second	R/W
F026	Stage 2 deceleration time	0.1~6553.0 second	10.0 second	R/W
F027	Stage 3 frequency	0.00Hz~650.00Hz	0.00Hz	R/W
F028	Stage 3 acceleration time	0.1~6553.0 second	10.0 second	R/W
F029	Stage 3 deceleration time	0.1~6553.0 second	10.0 second	R/W
F030	Stop method	0: deceleration stop 1: coast to stop	0	R/W
F031	Reversal run order	0: allow reversal run 1: prohibit reversal run	0	R/W
F032	Power factor. Filtering constant	50.00~99.99	85.20	FR/W
F033	Discharge brake circuit	0: disabled 2: enabled	2	R/W
F034	Restart after voltage malfunction	0: need to restart after fault reset 1: restart after auto fault reset	0	R/W
F035	Start-point of current when stall	10%~200%	200%	R/W
F036	Temporary stop output time	0.1~5.0 second	0.5 second	R/W

Function Code	Name	Settings	Factory Settings	Type
F037	Analog output FM (AM)	0: output frequency 1: output current 2: DC bus voltage	0	R/W
F038	Analog output FM (AM) gain	0~255	255	R/W
F039	Operation control method	0: panel control 1:FWD terminal controls run and stop; REV terminal controls run direction (refer to detailed function explanation)	0.0	R/W
F040	Frequency setting method	0: F000 setting 1: analog input 0~10V setting 2: analog input 4~20mA setting 6: inside counter setting 8: keypad setting 25: potentiometer knob setting 40: PID output setting	25.00	R/W
F041	MI1 input terminal function	0: no action 1: emergency stop 9: forward jog run 10: reversal jog run 50: start PID	0	R/W
F042	MI2 input terminal function			
F043	MI3 input terminal function			
F044	MI4 input terminal function			
F045	Open collector output MO1 function	0: stop output 1: inverter stop 4: during malfunction 5: no malfunction 6: during braking 7: during operation 10: output frequency approach	0	R/W
F046	Relay output terminal function		0	R/W
F047	Relay output terminal function		4	R/W
F048	Output current detection level	0~150%	100%	R/W
F049	Frequency detection level	0.00~650.00Hz	30.00Hz	R/W

Function Code	Name	Settings	Factory Settings	Type
F050	Frequency detection error limit	0.00~25.0Hz	5.0Hz	R/W
F051	Relay overcurrent response time	0~120 second	10 second	R/W
F052	Motor polar quantity	2~12	4	FR/W
F053	Rotation speed ratio	0~250%	100%	R/W
F054	Monitor parameter selection	0: output current 2: output current (percent) 5: power factor 32: timer display	0	R/W
F055	A/D (analog/digital) converter input signal selection	0~250	0	R/W
F056	A/D (analog/digital) converter output signal	0~1023	0	M
F057	Output frequency	0.00~650.00Hz		M
F058	Output speed (rpm)			M
F059	DC bus voltage (Vdc)			M
F060	Output voltage root-mean-square (Vrms)			M
F061	Output current root-mean-square (Irms) and other status display			M
F062	Heat sink temperature	0~100℃		M
F063	Digital input terminal status	0.0.0.0~1.1.1.1	0.0.0.0	M
F064	Control terminal status	0.0~1.1	0.0	M
F065	Digital output terminal status	0.0.0~1.1.1	0.0.0	M
F066	Reserved			
F067	Control mode selection	1: V/F control mode 3: vector control mode 4: torque control mode	1	FR/W
F068	Vector voltage compensation	0~30	10	FR/W

Function Code	Name	Settings	Factory Settings	Type
F069	Slip compensation coefficient F1/F2	0.0~99.99%	20.50%	FR/W
F070	Analog input gain proportional	0.0~100%	50%	R/W
F071	Timer response time	0.2~6553.0 second	5.0 second	R/W
F072	Simple PLC auto run function selection	0: normal run, stop, auto run 1: keep constant speed after staged auto run 2: stop after staged auto run and repeat 3: stop after staged auto run, reverse and repeat 4: repeat after staged auto run 5: reverse after staged auto run and repeat 6: auto run, stop and repeat	0	R/W
F073	Time setting of stage 1 PLC auto run	0.1~6553.0 second	15.0 second	R/W
F074	Time setting of stage 2 PLC auto run	0.1~6553.0 second	15.0 second	R/W
F075	Time setting of stage 3 PLC auto run	0.1~6553.0 second	15.0 second	R/W
F076	Time setting of stage 4 PLC auto run	0.1~6553.0 second	15.0 second	R/W
F077	Time setting of stage 5 PLC auto run	0.1~6553.0 second	15.0 second	R/W
F078	Rated current ratio of motor and inverter	10%~100%	100%	FR/W
F079	Speed tracing method selection	0: restart at lowest speed without tracing speed 1: start tracing at stopping frequency 2: start tracing at upper limit frequency 3: start tracing at setting frequency	1	R/W

Function Code	Name	Settings	Factory Settings	Type
F080	Output current range when tracing speed	10%~200%	150%	R/W
F081	Deceleration time during tracing speed	0.1~25.0 second	2.0 second	R/W
F082	Voltage restore time during tracing speed	0.1~5.0 second	0.5 second	R/W
F083	Reserved			
F084	Power supply voltage	40V~1000V	Different according to the inverter type	FR/W
F085	Reserved			
F086	Displayed current value compensation (percent)	70~140	100	FR/W
F087	Displayed voltage value compensation (percent)	70~140	100	FR/W
F088	Maximum output voltage (percent)	30~100	100	FR/W
F089	Minimum input value of terminal VI	0~1023	12	FR/W
F090	Maximum input value of terminal VI	0~1023	1012	FR/W
F091	Minimum input value of terminal CI	0~1023	12	FR/W
F092	Maximum input value of terminal CI	0~1023	780	FR/W
F093	Communication pattern. Communication address	0.01~99.99	0.01	FR/W
F094	Data initialization	0: data can't be initialized 1: data can be initialized	0	R/W
F095	Data protection	0: parameters of R/W type can be modified 1: all parameters can't be modified (except F000 and F095) 2: all parameters can only be written in RAM, but can't be conserved in EPROM	0	R/W

Function Code	Name	Settings	Factory Settings	Type
F096	Special parameters modification	0: parameters of FR/W type can't be modified 1: parameters of FR/W type can be modified	0	R/W
F097	Inverter software version	Different according to the inverter type		R
F098	Parameters can be monitored when LED light I is on	57: output frequency 58: output speed 59: DC bus voltage 60: output voltage 61: output current 62: heat sink temperature	61	R/W
F099	Parameters can be monitored when LED light Hz is on		57	R/W

Notice:

• The parameters of FR/W type is Factory Setting Type conversed in EPROM. These parameters only can be changed or modified by authorized personnel and professional technicians. Otherwise it may cause damage or injury.

• The parameters of M type are used for monitoring the operation status of inverter.

• The parameters of R type are constant.

5.2 DETAILED DESCRIPTION FOR PARAMETERS OF FUNCTION CODE

Function Code	Name	Settings	Factory Settings	Type
F000	Master frequency setting	0.00Hz~650.00Hz	50.00Hz	R/W

If F040 is set to 0, the setting frequency will be used as working frequency source.

Notice:

When inverter works under CTRL Mode, this parameter will always be used.

Function Code	Name	Settings	Factory Settings	Type
F001	Acceleration time	0.1~6553.0 second	10.0 second	R/W
F002	Deceleration time	0.1~6553.0 second	10.0 second	R/W

When F040 setting frequency is used as working frequency, use F001 to set acceleration time and use F002 to set deceleration time.

Notice:

• As the following Figure 5.1 shows, acceleration time can be set as: time needed when output frequency is accelerated from 0 Hz to upper limit frequency (set by F015).

• As the following Figure 5.1 shows, deceleration time can be set as: time needed when output frequency is decelerated from upper limit frequency to 0 Hz.

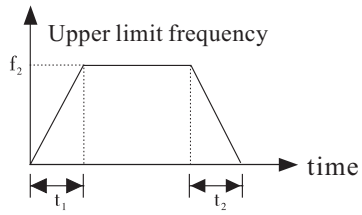


Figure 5.1 Accel./Decel. time diagram

Function Code	Name	Settings	Factory Settings	Type
F003	Input terminal MI5 function selection	0~99	73	FR/W
F004	Input terminal MI6 function selection	0~99	74	FR/W

The function of input terminal MI5 is set by F003. The factory setting is 73 which define FWD (forward run) function.

The function of input terminal MI6 is set by F004. The factory setting is 74 which define REV (reversal run) function.

Notice:

Only authorized personnel or professional technician can modify the FR/W type settings. Otherwise it may cause damage or injury.

Function Code	Name	Settings	Factory Settings	Type
F005	Start-Point frequency for DC brake during stopping	0.50Hz~650.00Hz	5.0Hz	R/W
F006	DC brake voltage during stopping	0~30%	5%	R/W
F007	DC brake time during stopping	0.0~25.0 second	1.0 second	R/W
F008	DC brake delay time during stopping	0.0~1.0 second	0.5 second	R/W

F005: When the output frequency is lower than start-point frequency for DC brake during stopping, the inverter will start DC brake. DC current will be output to the motor to start braking.

F006: When DC brake starts, input DC voltage percentage is as follows:

DC voltage percentage = motor rated voltage (percentage) ×F006

F007: It defines the continuous time of DC brake. When the time is over, DC brake voltage output will stop promptly. When the parameter of F007 is set to 0, DC brake function will be closed.

F008: If output frequency is lower than start-point frequency for DC brake during deceleration braking, output voltage will coast to DC brake voltage (F006 setting). After the delay time is over, DC current will be output to motor to start braking.

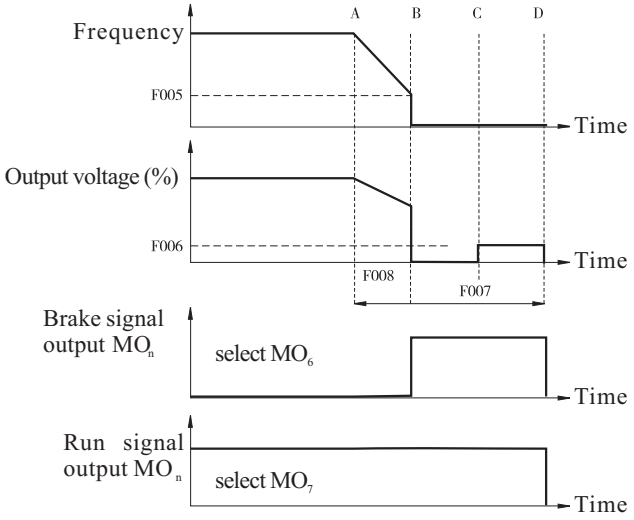


Figure 5.2 relationship diagram between frequency, output voltage and time during DC brake

Function Code	Name	Settings	Factory Settings	Type
F009	Torque boost setting	0~6%	3%	FR/W

When output frequency is very low, the parameter of F009 defines the minimum output voltage to boost torque.

⚠ CAUTION

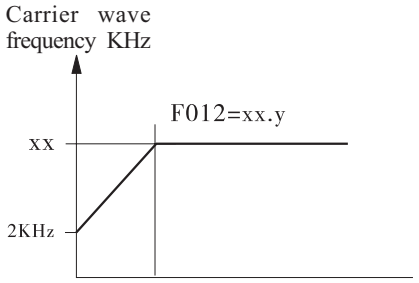
- After autotuning of inverter, torque boost setting will be automatic.
- The heat dissipation effect will become worse if motor works under low frequency for long time. Therefore, the value of torque boost setting should be set to lower level. Also, it could be better to apply external forced cooling. Otherwise it may cause motor to burn out.

Function Code	Name	Settings	Factory Settings	Type
F010	Motor rated frequency	0.50Hz~650.00Hz	50.00Hz	FR/W
F011	Motor rated voltage	30%~100%	100%	FR/W

The parameter setting of F010 and F011 defines the rated frequency and voltage of motor.

Function Code	Name	Settings	Factory Settings	Type
F012	Carrier frequency	2.0~16.9KHz	Different according to the inverter type	FR/W

The parameters of F012 setting are XX.Y which includes two types of parameter. XX defines the maximum carrier wave frequency. Y defines the turning point of carrier wave frequency. The minimum carrier wave frequency is fixed as 2 KHz. For example, the parameter value 12.5 means that the maximum carrier wave frequency is 12 KHz and the turning point is 5 KHz.



Turning point of carrier wave frequency

When inverter running frequency is larger than the turning point of carrier wave frequency, the carrier wave frequency setting value will become the maximum value. On the contrary, according to the running frequency the carrier wave frequency will auto tuning between the maximum value and minimum value.

Figure 5.3 the turning point diagram of carrier wave frequency

Carrier wave frequency table of different inverter type

Carrier wave frequency / Inverter type	Maximum value of carrier wave (KHz)	Maximum value of carrier wave (KHz)	Factory setting value(KHz)
4KW and below	16.9	2	8
5.5KW	16.9	2	6
7.5KW	16.9	2	5
11KW	16.9	2	5
15KW~75KW	16.9	2	4
93KW and above	16.9	2	2

⚠ CAUTION

- Only authorized personnel or professional technician can change the Factory Setting (FR/W type). Otherwise it may cause damage to the inverter.
- If carrier wave frequency is set to lower level, the harmonic wave of output current will make current waveform become worse. Although the leakage current and interference are small, the lower carrier wave frequency will cause much noise of motor and the motor temperature will rise quickly.
- If carrier wave frequency is set to larger level, this will make current waveform become better and decrease the motor noise. But it also brings wear and tear to electronic components. The inverter temperature will rise quickly and larger leakage current occurs.

Function Code	Name	Settings	Factory Settings	Type
F013	Time distance between Modbus (RS485 port) LED letters display	3~250ms	3ms	FR/W

When RS485 port is set to Modbus communication, the parameter of F013 define time distance of display between Modbus LED letters.

Function Code	Name	Settings	Factory Settings	Type
F015	Upper limit frequency	0.50Hz~650.00Hz	50.00Hz	FR/W
F016	Lower limit frequency	0.00Hz~650.00Hz	1.00Hz	FR/W

These two function codes define the working frequency of inverter. The settings should refer to motor rated frequency.

Function Code	Name	Settings	Factory Settings	Type
F017	Skip frequency	0.00Hz~650.00Hz	0.00Hz	R/W
F018	Skip frequency bandwidth	0.00Hz~5.00Hz	0.00Hz	R/W

These two function codes settings allow the prohibition or "jumping" of critical frequencies so that the motor can operate without resonance caused by machine system. Set the value to 0.0 Hz disables this function.

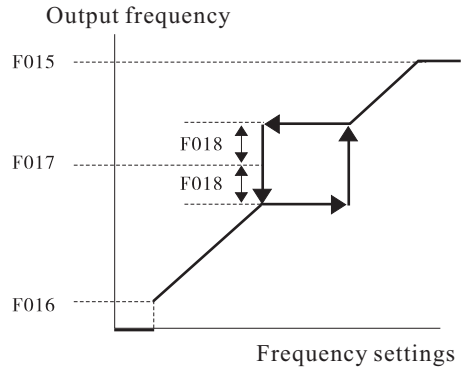


Figure 5.4 skip frequency diagram

Function Code	Name	Settings	Factory Settings	Type
F019	Jog frequency	0.00Hz~650.00Hz	10.00Hz	R/W
F020	Jog acceleration/ deceleration time	0.1~25.0 second	10.0 second	R/W

F019 settings define the inverter frequency when jog running is required.
F020 settings define the acceleration/deceleration time of jog running.

Function Code	Name	Settings	Factory Settings	Type
F021	Stage 1 frequency	0.00Hz~650.00Hz	0.00Hz	R/W
F022	Stage 1 acceleration time	0.1~6553.0 second	10.0 second	R/W
F023	Stage 1 deceleration time	0.1~6553.0 second	10.0 second	R/W

The settings of F021, F022 and F023 define the frequency and accel./decel time when stage 1 speed is required.

Function Code	Name	Settings	Factory Settings	Type
F024	Stage 2 frequency	0.00Hz~650.00Hz	0.00Hz	R/W
F025	Stage 2 acceleration time	0.1~6553.0 second	10.0 second	R/W
F026	Stage 2 deceleration time	0.1~6553.0 second	10.0 second	R/W

The settings of F024, F025 and F026 define the frequency and accel./decel time when stage 2 speed is required.

Function Code	Name	Settings	Factory Settings	Type
F027	Stage 3 frequency	0.00Hz~650.00Hz	0.00Hz	R/W
F028	Stage 3 acceleration time	0.1~6553.0 second	10.0 second	R/W
F029	Stage 3 deceleration time	0.1~6553.0 second	10.0 second	R/W

The settings of F027, F028 and F029 define the frequency and accel./decel time when stage 3 speed is required.

Notice:

When use PID function, F027, F028 and F029 will be switched to PID parameter setting.

Function Code	Name	Settings	Factory Settings	Type
F030	Stop method	0: deceleration stop; 1: coast to stop	0	R/W

0: deceleration stop

When F030 is set to 0, inverter decreases output frequency to 0. And the motor will decelerate to a stop

1: coast to stop

When F030 is set to 1, inverter stops frequency output. The motor will coast to stop by its mechanical inertia.

Notice:

When use coast to stop method, overcurrent and over voltage protection may occur if inverter restarts at 0 Hz before the motor finishes its stop. Set F079 to 1, 2 or 3, inverter will restart by tracing speed method.

Function Code	Name	Settings	Factory Settings	Type
F031	Reversal run order	0: allow reversal run 1: prohibit reversal run	0	R/W

0: Both of forward run and reversal run are allowable.

1: Reversal run is prohibited.

Function Code	Name	Settings	Factory Settings	Type
F032	Power factor. Filtering constant	50.00~99.99	85.20	FR/W

The parameters of F032 setting are XX.YY which includes two types of parameter. XX defines the motor power factor which can be found on motor nameplate. YY defines filtering constant of vector compensation.

Function Code	Name	Settings	Factory Settings	Type
F033	Discharge brake circuit	0: disabled 2: enabled	2	R/W

0: Brake circuit discharge is disabled.

1: Brake circuit discharge can start under the following conditions:

- During inverter operating.
- No malfunction alarm of inverter.
- During acceleration time.
- DC bus voltage is over 117%.

2: Brake circuit discharge can start under the following conditions:

- During inverter operating.
- No malfunction alarm of inverter.
- DC bus voltage is over 117%.

Function Code	Name	Settings	Factory Settings	Type
F034	Restart after voltage malfunction	0: need to restart after fault reset 1:restart after auto fault reset	0	R/W

0: When input voltage restores to normal after voltage malfunction, inverter needs to restart after reset. Inverter cannot restart before reset.

1: When input voltage restores to normal, inverter will restart automatically and start tracing speed after the waiting-time (set by F036) is over.

⚠ CAUTION

- If F034 is set to 1, F079 must be set to 1, 2 or 3 to enable the function of tracing speed. Otherwise it may cause overcurrent or over voltage protection.
- Because the restore of malfunction of power supply may cause motor restart suddenly, select the F034 function carefully. Otherwise it may cause damage or injury.

Function Code	Name	Settings	Factory Settings	Type
F035	Start-point of current when stall	10%~200%	200%	R/W

When output current exceeds the value set by F035, inverter decelerates automatically to prevent the motor from stall.

Function Code	Name	Settings	Factory Settings	Type
F036	Temporary stop output time	0.1~5.0 second	0.5 second	R/W

When input voltage malfunction occurs or inverter needs a temporary stop of output frequency, use F036 to define temporary stop output time. After the temporary waiting-time is over, inverter can restart.

Notice:

Input voltage malfunction includes over voltage and under voltage. The LED displays the malfunction as 0.UP and 0.OP.

Function Code	Name	Settings	Factory Settings	Type
F037	Analog output FM (AM)	0~17	0	R/W
F038	Analog output FM (AM) gain	0~255	255	R/W

The parameters of F037 define the analog signals output by terminal FM (AM).
The parameters of F038 define the value of FM (AM) output signals.
The FM (AM) output signals are as following table describes:

F037	FM (AM) output signals	Output proportional
0	Output frequency	+10V×F057/(F015)
1	Output current	
2	DC bus voltage	+10V×F059/1000
3	Output voltage	+10V×F060/(2×F084)
4~6	Reserved	
7	PID output	FM=+10V×(PID output)
8	PID+VI bias voltage input	When MIn(54) is on: +10V×(PID gain×(PID output + PID bias voltage×V1)) When MIn(54) is off: +10V×(PID output)
9	PID+CI bias voltage input	When MIn(54) is on: +10V×(PID gain×(PID output + PID bias voltage×V2)) When MIn(54) is off: +10V×(PID output)
10	PID+DI bias voltage input	When MIn(54) is on: +10V×(PID gain×(PID output + PID bias voltage×V3)) When MIn(54) is off: +10V×(PID output)
11	PID+F028 bias voltage input	When MIn(54) is on: +10V×(PID gain×(PID output + PID bias voltage×F028)) When MIn(54) is off: +10V×(PID output)
12	Available output voltage setting	+10V×(F038/255)
13~16	Reserved	
17	Heat sink temperature	+10V×(F062/100)

Function Code	Name	Settings	Factory Settings	Type
F039	Operation control method	0.0~9.9	0.0	R/W

The parameters of F039 define the different types of running and stop command. It's important to select the running control method before inverter starts.

The F039 parameters X.Y include two types of parameter. The control command is determined by one of them.

When MIn =89 and the selected input terminal is ON, control command is set by Y.
When MIn =89 and the selected input terminal is OFF, control command is set by X.

When MIn =90 and the selected input terminal is ON, speed source is set by YY and control command is set by Y. When MIn =90 and the selected input terminal is OFF, speed source is set by XX and control command is set by X.

0: Running command is controlled by panel keypad.

- Push FWD key, inverter run forward.
- Push REV key, inverter run reversely.
- Push STOP key, inverter stops running.

1: Running command is controlled by terminal FWD and REV.

- Terminal FWD controls running or stop of inverter.
- Terminal REV controls inverter running direction.

2: Outside terminals control (1): controlled by outside terminal FWD and REV.

- Outside terminal FWD controls inverter running forward.
- Outside terminal REV controls inverter running reversely.

3: Control method is similar with F039=1. But when inverter starts, it will firstly inspect the status that terminal FWD is OFF.

4: Outside terminals control (2): controlled by outside terminal FWD and REV. But when terminal FWD and REV are ON, inverter LED displays "- - on".

F039	Terminal FWD	Terminal REV	Function
0	disabled	disabled	Controlled by panel keypad
1	OFF	disabled	Stop running
	ON	OFF	Forward running
	ON	ON	Reverse running
2	OFF	OFF	Stop running
	OFF	ON	Reverse running
	ON	disabled	Forward running
3	Control method is similar with F039=1. When terminal FWD is ON, inverter LED will display "—on" to remind user to remove the control signal.		
4	Control method is similar with F039=2. When terminal FWD or REV is ON, inverter LED will display "—on" to remind user to remove the control signal.		

Function Code	Name	Settings	Factory Settings	Type
F040	Frequency setting method	0: F000 setting 1: analog input 0~10V setting 2: analog input 4~20mA setting 6: inside counter setting 8: keypad setting 25: potentiometer knob setting 40: PID output setting	25.00	R/W

Notice:

For more detailed information, please refer to Section 5.3 F040 Frequency Setting Method.

Function Code	Name	Settings	Factory Settings	Type
F041	MI1 input terminal function	0~99	0	R/W
F042	MI2 input terminal function	0~99	0	R/W
F043	MI3 input terminal function	0~99	0	R/W
F044	MI4 input terminal function	0~99	0	R/W

Terminal MI1, MI2, MI3, MI4, FWD and REV are multi-function digital input terminals. They have the same functions. When the input terminal circuit is open, it means they are OFF. When the circuit between input terminals and DCM terminals is closed, they are ON. User can select the special function of them.

Notice:

For more detailed information, please refer to Section 5.4 Multi-function Digital Input Terminal Setting.

Function Code	Name	Settings	Factory Settings	Type
F045	Open circuit collector output MO1 function	0~99	0	R/W
F046	Relay output terminal function	0~99	0	R/W
F047	Relay output terminal function	0~99	4	R/W

Notice:

For more detailed information, please refer to Section 5.5 Digital Output Terminal Setting.

Function Code	Name	Settings	Factory Settings	Type
F048	Output current detection level	l0~150%	100%	R/W

F048 parameter settings define the detection level of current monitor.

Function Code	Name	Settings	Factory Settings	Type
F049	Frequency detection level	0.00~650.00Hz	30.00Hz	R/W
F050	Frequency detection error limit	0.00~25.0Hz	5.0Hz	R/W

The parameters of F049 and F050 will be used when set digital output function of SPE, SPA, SPZ and SP0.

Notice:

For more detailed information, please refer to Section 5.5 Digital Output Terminal Setting.

Function Code	Name	Settings	Factory Settings	Type
F051	Relay overcurrent response time	0~120 second	10 second	R/W

The parameter of F051 defines the response time of relay caused by overcurrent. If F051 is set to 0, the relay takes no action. For inverter of P and Z type, modify this parameter carefully. If inverter current is larger than motor current, modify the parameter of F078 to protect the motor from overcurrent damage.

Function Code	Name	Settings	Factory Settings	Type
F052	Motor polar quantity	2~12	4	FR/W
F053	Rotation speed ratio	0~250%	100%	R/W

The setting value of F052 and F053 are used to calculate the RPM (rotation per minute). The calculating formula is as follows:

$$\text{rpm} = \frac{120 \times \text{output frequency (set by F057)}}{\text{motor polar quantity (set by F052)}} \times \text{rotation speed ratio (set by F053)}$$

Function Code	Name	Settings	Factory Settings	Type
F054	Monitor parameter selection	0~250	0	R/W

The parameters set by F054 are the items displayed by F061 that monitor the operation status of inverter.

0: output current Irms (Amp.)

1: output current Irms (inverter rated current percent)

2: output current Irms (motor rated current percent)

3: power angle θ (current phase delay angle)

4: output power VA = $\sqrt{3} \times$ Vrms $\times$ Irms

5: power factor PF = cos (θ)

6: input power Watt = $\sqrt{3} \times$ Vrms $\times$ Irms $\times$ cos (θ)

7: reserved

8: reserved

9: reserved

10: preset value of output power

11: cumulative level of over current

32: when use timer function, display time value.

Function Code	Name	Settings	Factory Settings	Type
F055	A/D(analog / digital) converter input signal selection	0~250	0	R/W
F056	A/D(analog / digital) converter output signal	0~1023	0	M

F055 setting value	output signal after A/D(analog / digital) converting (F056)
0	monitoring value of DC voltage (Vdc)
1	monitoring value of Iv
2	monitoring value of Iw
3	monitoring value of VI
4	monitoring value of CI
5	monitoring value of DI
6	monitoring value of temperature sensor
7	reserved
8	When use RS485 port to write in parameter, display pending parameters written-in EPROM
9~31	reserved
32	When use timer function, display time value.

Select the monitoring signal by F055. The A/D converter changes the analog signal into digital signal which is reserved in F056. The parameter value after converting is between 0 and 1023.

Function Code	Name	Settings	Factory Settings	Type
F057	Output frequency	0.00~650.00Hz		M
F058	Output speed (rpm)			M
F059	DC bus voltage (Vdc)			M
F060	Output voltage root-mean-square (Vrms)			M
F061	Output current root-mean-square (Irms) and other status display			M
F062	Heat sink temperature	0~100℃	F062	Heat sink temperature

The function of F057~F062 is to monitor the operation status of inverter.

F057: output frequency

F058： motor rotation speed (rpm). Refer to the function and calculating formula of F052 and F053. When output rotation speed is larger than 10000rpm, the panel displays XX.XX Krpm. When output rotation speed is less than 9999rpm, the panel displays XXXX. rpm.

F059: DC voltage value is measured by inside capacitor. The calculating formula is:

Vdc = 1.414×Vac (input voltage)

F060: output voltage Vrms (Vrms value of output voltage)

F061: output current Irms (Irms value of output current) and other status display

F062: When the temperature of heat sink is between 45℃ and 80℃, fan of inverter will work continuously. When the temperature is over 80℃, inverter will stop and display OH malfunction (malfunction code: OH).

Function Code	Name	Settings	Factory Settings	Type
F063	Digital input terminal status	0.0.0.0	0.0.0.0~1.1.1.1	M
F064	Control terminal status	0.0	0.0~1.1	M
F065	Digital output terminal status	0.0.0	0.0.0~1.1.1	M

F063: digital input terminal MI1~MI4 status

F064: control terminal FWD and REV status

F065: digital output terminal MO1, A-B, C-D status

Digital input terminal status

Control terminal status

Digital output terminal status

Function Code	Name	Settings	Factory Settings	Type
F067	Control mode selection	1: V/F control mode 3: vector control mode 4: torque control mode	1	FR/W

0: reserved

1: standard V/F control mode

Set F067 to 1, inverter works under V/F control mode. Inverter outputs SPWM (Sine Wave of PWM) to motor and inspect output AC current. Inverter can compensate for the loss caused by dead time effect and decrease the vibration of motor.

2: reserved

3: vector control mode

Set F067 to 3, inverter works under vector control mode. Vector control system can make inverter provide additional torque compensation voltage. Inverter can increase the motor operation torque at low speed and compensate the slip caused by load with larger current.

4: torque control mode

Set F067 to 4, inverter works under torque control mode. It is similar with V/F control mode. When output frequency exceeds upper limit value, inverter will decrease the output frequency automatically.

Function Code	Name	Settings	Factory Settings	Type
F068	Vector voltage compensation	0~30	10	FR/W

This is voltage compensation coefficient under vector control mode. Refer to **4.2.3 Motor Parameter Autotuning**. Usually user doesn't need to change it.

Function Code	Name	Settings	Factory Settings	Type
F069	Slip compensation coefficient F1/F2	0.0~99.99%	20.50%	FR/W

F1: phase compensation coefficient at low speed

Set F067 to 1 and F054 to 3. Make inverter work at 5% low frequency. For example, when F010 = 60Hz× 5% = 3Hz, read the relative power angle and calculate the value of F1. The formula is: F1 = 50/tan (θ)

F2: load compensation coefficient at high speed

Set F067 to 3 and make inverter work at 60Hz. Measure the rotation speed fluctuation between full load and without load. Modify the value of F2 to decrease the speed fluctuation caused by load variation.

Function Code	Name	Settings	Factory Settings	Type
F070	Analog input gain proportional	0.0~100%	50%	R/W

Function Code	Name	Settings	Factory Settings	Type
F071	Timer response time	0.2~6553.0 second	5.0 second	R/W

About timer response time setting, please refer to **Section 5.4 Multi-function Digital Input Terminal Setting.**

Function Code	Name	Settings	Factory Settings	Type
F072	Simple PLC auto run function selection	0~6	0	R/W
F073	Time setting of stage 1 PLC auto run	0.1~6553.0 second	15.0 second	R/W
F074	Time setting of stage 2 PLC auto run	0.1~6553.0 second	15.0 second	R/W
F075	Time setting of stage 3 PLC auto run	0.1~6553.0 second	15.0 second	R/W
F076	Time setting of stage 4 PLC auto run	0.1~6553.0 second	15.0 second	R/W
F077	Time setting of stage 5 PLC auto run	0.1~6553.0 second	15.0 second	R/W

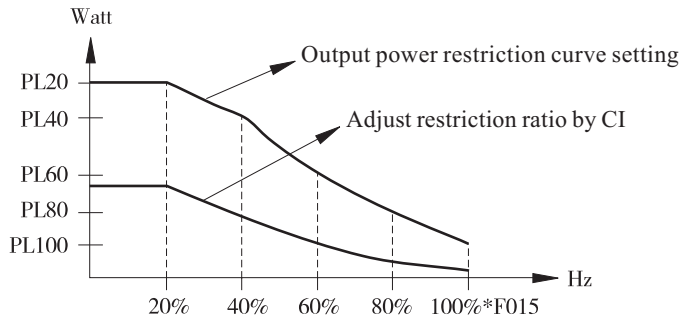


Figure 5.5 diagram of output power restriction curve

Notice:

• Under torque control mode, F073~F077 parameters define output power restriction curve that can be controlled by CI or DI. Refer to MIn = 75 of Section 5.4 Multi-function Digital Input Terminal Setting.

• For more details of simple PLC function, refer to Section 5.6 Simple PLC Auto run Function.

F072 must be set to 0 because auto run mode is cancelled.

PL20 (F073): the value of output power restriction when output frequency is 20% of upper limit frequency (output frequency = F015×20%)

PL40 (F074): the value of output power restriction when output frequency is 40% of upper limit frequency (output frequency = F015×40%)

PL60 (F075): the value of output power restriction when output frequency is 60% of upper limit frequency (output frequency = F015×60%)

PL80 (F076): the value of output power restriction when output frequency is 80% of upper limit frequency (output frequency = F015×80%)

PL100 (F077): the value of output power restriction when output frequency is 100% of upper limit frequency (output frequency = F015×100%)

The expression of PL20~PL100 is: $PL = W \times 10^n$. For example, if F015 = 60 Hz

PL20 (F073) = 15.2 (that means output frequency is 60×20% = 12Hz), the value of output power restriction is:

$PL20 = 15 \times 10^2 = 1500$ Watt.

The actual output power is: P (Watt) $= \sqrt{3} \times Vout \times Iout \times \cos\theta$

About the monitoring of output current and power, please refer to F054 descriptions.

Function Code	Name	Settings	Factory Settings	Type
F078	Rated current ratio of motor and inverter	10%~100%	100%	FR/W

F078 parameter defines the percent of motor rated current and inverter rated current. Refer to F051 function description.

Function Code	Name	Settings	Factory Settings	Type
F079	Speed tracing method selection	0~3	1	R/W
F080	Output current range when tracing speed	10%~200%	150%	R/W
F081	Deceleration time during tracing speed	0.1~25.0 second	2.0 second	R/W
F082	Voltage restore time during tracing speed	0.1~5.0 second	0.5 second	R/W

The parameters of F079~F082 define the characteristic of tracing speed when restart after instantaneous stop.

F079 parameter setting:

0: restart at lowest speed without tracing speed

1: start tracing at stopping frequency

2: start tracing at upper limit frequency

3: start tracing at setting frequency

Set Digital Input Terminal Function to Start the Program of Speed Tracing

Set digital input terminal MIn = 8. When the input terminal is ON, inverter will stop output. When the input terminal is restored to OFF, inverter still stops output for some time (set by F036). When the pending time is over, inverter starts the program of tracing speed.

Normal after Input Voltage Malfunction (F034 = 1)

If input voltage malfunction occurs (over voltage or under voltage), inverter stops output. When input voltage restores to normal, inverter still stops output for some time (set by F036). When the pending time is over, inverter starts the program of tracing speed.

As the following diagram shows, there are four steps of tracing speed after the pending time is set by F036.

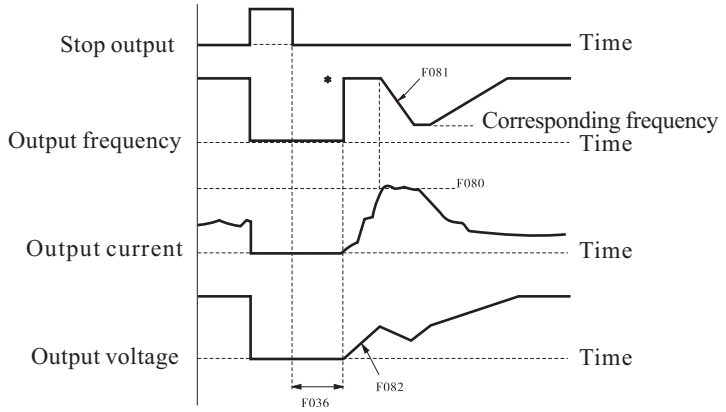


Figure 5.6 time diagram of tracing speed

Step 1:

According to F079 setting, inverter outputs frequency firstly. There is no output voltage at this moment.

Step2:

Keep the setting frequency unchanged. According to voltage restore time set by F082, increase output voltage. During the increasing process, inspect the output current.

Step 3:

If output current exceeds the value set by F080, decrease output frequency according to deceleration time set by F081. When output current is lower than the value set by F080, inverter output frequency and motor speed are unified.

Step 4:

When the above steps are finished, increase inverter output frequency up to the former setting value.

Function Code	Name	Settings	Factory Settings	Type
F083	Reserved			

Function Code	Name	Settings	Factory Settings	Type
F084	Power supply voltage	40V~1000V	Different according to the inverter type	FR/W

According to the input voltage value set by F084, the relative calculating formula of voltage malfunction level is as follows:

point of over voltage protection = 1.414×F084×130%

'point of under voltage protection = 1.414×F084×70%

'restore point after over voltage protection = 1.414×F084×120%

'restore point after under voltage protection = 1.414×F084×80%

'voltage point when contactor is ON = 1.414×F084×69%

'voltage point when contactor is OFF = 1.414×F084×65%

'start point of DC brake discharge = 1.414×F084×117% (refer to F033 descriptions)

Notice:

Contactor is used for switching charge-resistor.

Function Code	Name	Settings	Factory Settings	Type
F085	Reserved			

Function Code	Name	Settings	Factory Settings	Type
F086	Displayed current value compensation (percent)	70~140	100	FR/W
F087	Displayed voltage value compensation (percent)	70~140	100	FR/W

The parameter of F086 is used to rectify the displayed value of output current.

The parameter of F087 is used to rectify the displayed value of DC voltage (Vdc).

Function Code	Name	Settings	Factory Settings	Type
F088	Maximum output voltage (percent)	30~100	100	FR/W

F088 defines the maximum output voltage when inverter works at upper limit frequency. Refer to descriptions of F010, F011 and F015.

Function Code	Name	Settings	Factory Settings	Type
F089	Minimum input value of terminal VI	0~1023	12	FR/W
F090	Maximum input value of terminal VI	0~1023	1012	FR/W

Setting method of minimum input value of terminal VI:

Set F055 to 3 and connect input terminal of VI to ACM terminal. The parameter read by F056 is the minimum input value of VI which is written in F089 at the same time.

Setting method of maximum input value of terminal VI:

Set F055 to 3 and connect input terminal of VI to 10V terminal. The parameter read by F056 is the maximum input value of VI which is written in F090 at the same time.

Function Code	Name	Settings	Factory Settings	Type
F091	Minimum input value of terminal CI	0~1023	12	FR/W
F092	Maximum input value of terminal CI	0~1023	780	FR/W

Setting method of minimum input value of terminal CI:

Set F055 to 4 and connect input terminal of CI to ACM terminal. The parameter read by F056 is the minimum input value of CI which is written in F091 at the same time.

Setting method of maximum input value of terminal CI:

Set F055 to 4 and connect input terminal of CI to +5V terminal. The parameter read by F056 is the maximum input value of CI which is written in F092 at the same time.

Notice:

The parameters of F089, F090, F091 and F092 are Factory-Setting. If not necessary, do not modify them.

Function Code	Name	Settings	Factory Settings	Type
F093	Communication pattern. Communication address	0.01~99.99	0.01	FR/W

For more descriptions, refer to **Chapter 7 RS485 and PID Function Description.**

Function Code	Name	Settings	Factory Settings	Type
F094	Data initialization	0: data can't be initialized 1: data can be initialized	0	R/W

The parameter initialization steps are as follows:

Step1:

Set F095 to 0 and F094 to 1.

Step 2:

Reset inverter by hardware or software (push RESET key under Fault Display Mode). And then the parameters of R/W type in EPROM will be initialized to factory setting value.

Function Code	Name	Settings	Factory Settings	Type
F095	Data protection	0~2	0	R/W
F096	Special parameters modification	0~2	0	R/W

The function of F095 parameters:

0: parameters of R/W type can be modified

1: all parameters can't be modified (except F000 and F095)

2: all parameters can only be written in RAM, but can't be conserved in EPROM

The function of F096 parameters:

0: parameters of FR/W type can't be modified

1: parameters of FR/W type can be modified

Function Code	Name	Settings	Factory Settings	Type
F097	Inverter software version	Different according to the inverter type	R	F097

This parameter is used to display inverter software version.

Function Code	Name	Settings	Factory Settings	Type
F098	Parameters can be monitored when LED light I is on	57: output frequency 58: output speed 59: DC bus voltage 60: output voltage 61: output current 62: heat sink temperature	61	R/W
F099	Parameters can be monitored when LED light Hz is on		57	R/W

Under Monitor Mode (MTR mode), F098 an F099 can be used to monitor two groups of parameters. Refer to the setting value of F057~F062.

F098: the parameters which can be monitored when LED light I is on.

F099: the parameters which can be monitored when LED light Hz is on.

5.3 F040 FREQUENCY SETTING METHOD

The expression of F040 parameters is XX.YY. One of them (XX and YY) defines the control command source. Refer to MIn = 88 and MIn = 90 of **Section 5.4 Multi-function Digital Input Terminal Setting.** When terminal MIn(88) and MIn(90) are ON, control command is set by YY. Otherwise control command is set by XX.

5.3.1 F040 Frequency Setting Method Table

F040	Frequency Setting
0	Set by F000 frequency selection. Refer to F039 descriptions.
1	Set by analog signal 0-10V input terminal VI. Refer to F039 descriptions.
2	Set by analog signal 4-20mA input terminal CI. Refer to F039 descriptions.
3	Set by panel input. Refer to F039 descriptions.
4	Both output frequency and run direction are set by terminal VI
5	Both output frequency and run direction are set by terminal CI
6	Set by inside counter. Refer to F039 descriptions
7	Similar to F040 = 6. But preset the value of F000 into counter after reset or start.
8	Similar to F040 = 3. But presetting frequency is the setting value of F000. The modified frequency can be written in F000 automatically.
9	Similar to F040 = 4. But motor still runs at low speed when output frequency is lower than F016.
10	Similar to F040 = 5. But motor still runs at low speed when output frequency is lower than F016.
11	Same as F040 = 6.
12	This defines the setting method for multi-inverter link-up work. Frequency setting value = VI×(100% ± (F070×CI))
13	Frequency setting value = CI±(F015×(F070×VI))
14~16	Reserved

F040	Frequency Setting
17	Similar to F040 = 1. But motor still runs at low speed when output frequency is lower than F016.
18	Similar to F040 = 2. But motor still runs at low speed when output frequency is lower than F016.
19	Similar to F040 = 11. But the modified value of counter can be written in F000 automatically.
20	Similar to F040 = 18. But the definition of low speed and high speed is contrary to F040 = 18.
21	Frequency setting value = panel setting value×(1 ±(F070×CI)).
22	Frequency setting value = panel setting value ±(F015×(F070×VI)). But motor still runs at low speed when output frequency is lower than F016.
23~24	Reserved
25	Similar to F040 =2. But output frequency is set by terminal DI. (factory setting: set by potentiometer knob)
26	Similar to F040 = 5. But both output frequency and run direction are set by terminal DI.
27	Similar to F040 = 26. But motor still runs at low speed when output frequency is lower than F016.
28	Similar to F040 = 12. Frequency setting value = VI×(100% ±(F070×DI))
29	Similar to F040 = 12. Frequency setting value = DI×(100% ±(F070×VI))
30	Similar to F040 = 2. Set by terminal DI. But motor still runs at low speed when output frequency is lower than F016.
31	Similar to F040 = 30. But the definition of low speed and high speed is contrary to F040 = 30.
32	Similar to F040 = 20. But the definition of low speed and high speed is contrary to F040 = 20.
33	Frequency setting value = panel setting value×(1 ±(F070×VI)).
34	Frequency setting value = panel setting value×(1 ±(F070×DI)).

F040	Frequency Setting
35	Frequency setting value = panel setting value ±(F015×(F070×CI)). But motor still runs at low speed when output frequency is lower than F016.
36	Frequency setting value = panel setting value ±(F015×(F070×DI)). But motor still runs at low speed when output frequency is lower than F016.
37	FWD run controlled by terminal VI. REV run controlled by terminal CI.
38	FWD run controlled by terminal CI. REV run controlled by terminal VI.
39	Similar to F040 = 0. But motor still runs at low speed when output frequency is lower than F016.
40	Set by PID output.
41~45	Reserved
46	Set by RS485 port.
47	Reserved
48	Frequency setting value = PID gain × (PID output + PID bias voltage × VI).
49	Frequency setting value = PID gain × (PID output + PID bias voltage × CI).
50	Frequency setting value = PID gain × (PID output + PID bias voltage × DI).
51	Frequency setting value = PID gain × (PID output + PID bias voltage × F028).

5.3.2 F040 Frequency Setting Descriptions

F040	Frequency Setting
0	Set by F000 frequency selection.

The frequency parameter stored in F000 is master frequency. And run direction is set by F039. When frequency data is written in F000, it will keep unchangeable during inverter working.

Notice:

Modify the value of F000 to change output frequency when inverter is working.

F040	Frequency Setting
1	Set by analog signal 0-10V input terminal VI.

Inverter output frequency is set by input voltage signal of terminal VI. And run direction is set by F039.

When input voltage is 10V, output frequency is equal to F015 setting value. The relationship between analog input voltage and output frequency is as the following diagram shows:

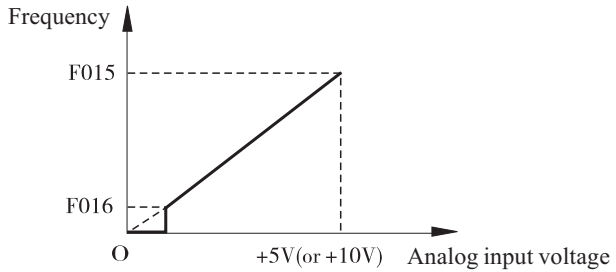


Figure 5.7

Notice:

If necessary, modify the analog input range by setting F089 and F090.

F040	Frequency Setting
2	Set by analog signal 4-20mA input terminal CI.

Inverter output frequency is set by input current signal (or +5V voltage) of terminal CI. And run direction is set by F039.

When input maximum signal value, output frequency is equal to F015 setting value. The relationship between analog input value and output frequency is as the following diagram shows:

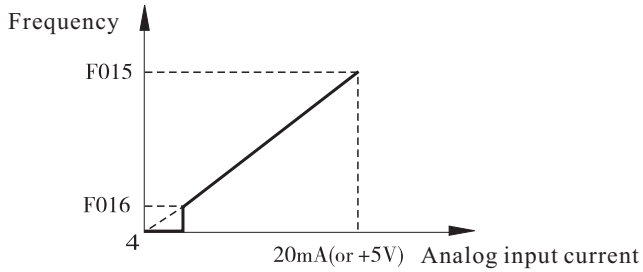


Figure 5.8

Notice:

If necessary, modify the analog input range by setting F091 and F092.

F040	Frequency Setting
3	Set by panel input.

Output frequency is set by panel input. When use serial communication to control, output frequency is set by RS485 command. Run direction is set by F039. When output frequency is lower than F016, motor still runs at low speed.

F040	Frequency Setting
4	Both output frequency and run direction are set by terminal VI

Both output frequency and run direction are set by terminal VI. The output frequency is equal to F015. When input maximum voltage value, motor runs forward. When input value is 0V, motor runs reversely. When input signal is mid-value of VI, inverter will stop output. Compare it with F040 = 9.

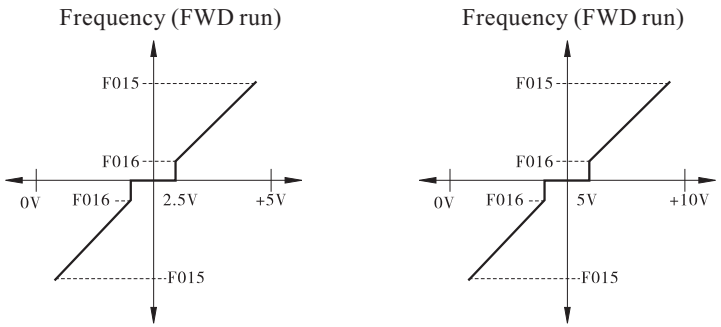


Figure 5.9

Notice:

If necessary, modify the analog input range by setting F089 and F090.

F040	Frequency Setting
5	Both output frequency and run direction are set by terminal CI

Both output frequency and run direction are set by terminal CI. The output frequency is equal to F015. When input maximum signal value, motor runs forward. When input value is zero, motor runs reversely. When input signal is mid-value of CI, inverter will stop output. Compare it with F040 = 10.

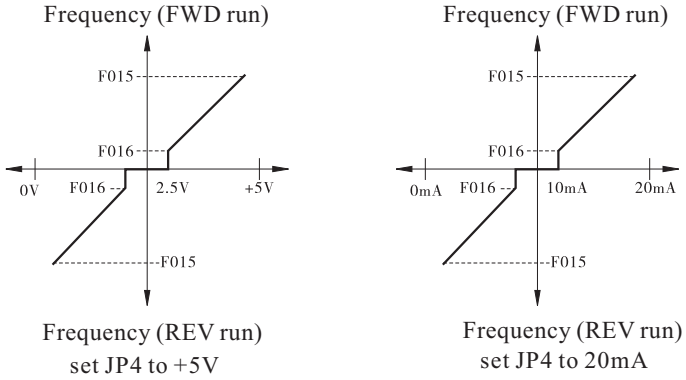


Figure 5.10

Notice:

If necessary, modify the analog input range by setting F091 and F092

F040	Frequency Setting
6	Set by inside counter. Refer to F039 descriptions

F040	Frequency Setting
7	Similar to F040 = 6. But preset the value of F000 into counter after reset or start.

When F040 = 7, motor still runs at low speed when inverter output frequency is lower than F016.

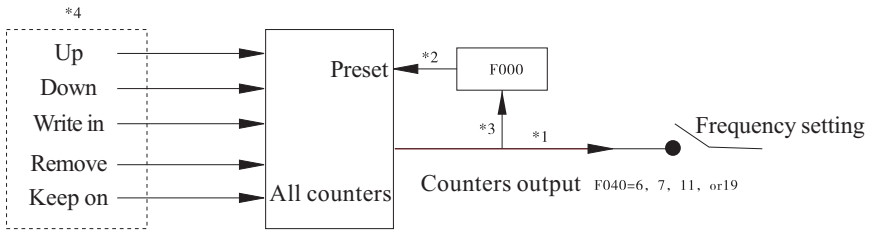


Figure 5.11 diagram of inside counter

Notice:

• When set F040 to 6, 7, 11 or 19, output frequency is set by inside counter.

• When set F040 to 7 or 19, the value of F000 will be preset in counter after reset or start.

• When set F040 to 19, modified frequency value can be written in F000.

• About digital input signal function, refer to Section 5.4 Multi-function Digital Input Terminal Setting.

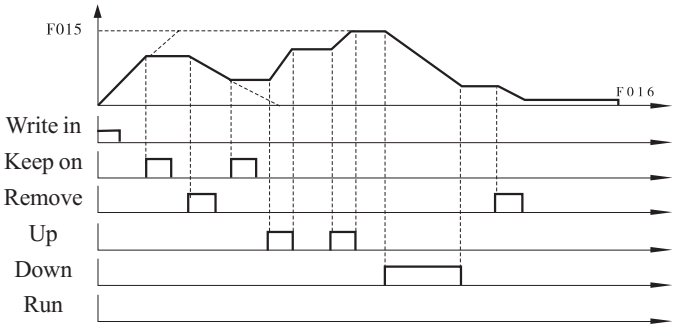


Figure 5.12 diagram of counter function

F040	Frequency Setting
8	Similar to F040 = 3. But presetting frequency is the setting value of F000. The modified frequency can be written in F000 automatically.

When F040 = 8, motor still runs at low speed when inverter output frequency is lower than F016.

F040	Frequency Setting
9	Similar to F040 = 4. But motor still runs at low speed when output frequency is lower than F016.

Both output frequency and run direction are set by terminal VI. When input maximum voltage value, motor runs forward at the frequency set by F015. When input value is 0V, motor runs reversely at the frequency set by F015. When input signal is mid-value of VI, output frequency is set by F016. Compare it with F040 = 4.

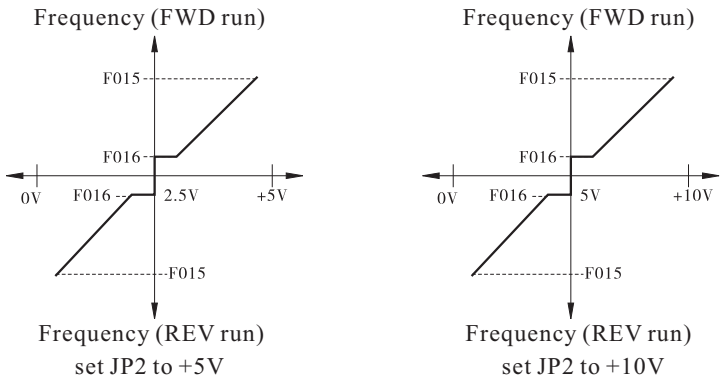


Figure 5.13

Notice:

If necessary, modify the analog input range by setting F089 and F090.

F040	Frequency Setting
10	Similar to F040 = 5. But motor still runs at low speed when output frequency is lower than F016.

Both output frequency and run direction are set by terminal CI. When input maximum signal value, motor runs forward at the frequency set by F015. When input value is zero, motor runs reversely at the frequency set by F015. When input signal is mid-value of CI, output frequency is set by F016. Compare it with F040 = 5.

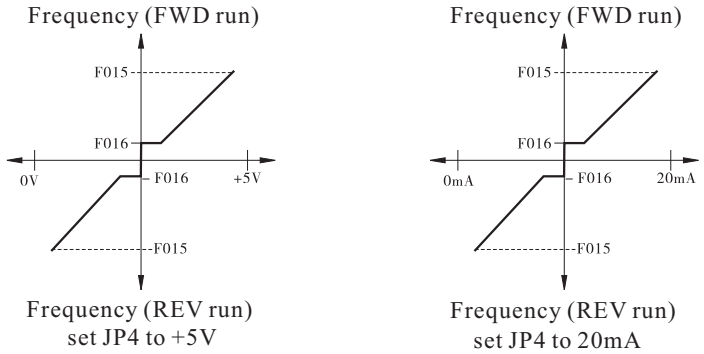


Figure 5.14

Notice:

If necessary, modify the analog input range by setting F091 and F092.

F040	Frequency Setting
11	Same as F040 = 6.
12	This defines the setting method for multi-inverter link-up work. Frequency setting value = VI× (100% ± (F070× CI))

The master frequency is set by VI input. When input maximum value of CI, the variation rate is: 100%+F070. When input minimum value of CI, the variation rate is: 100%－F070. When output frequency is lower than F016, motor still runs at low speed. The typical application is as the following diagram shows: the basic frequency of every inverter is set by VI and speed rate is set by CI.

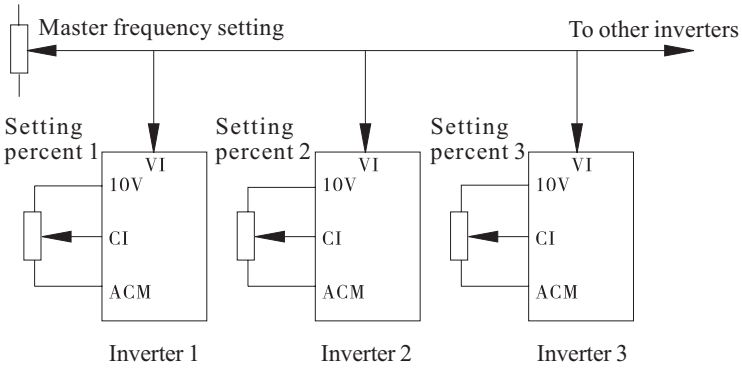


Figure 5.15

F040	Frequency Setting
13	Frequency setting value = CI ±(F015×(F070×VI))

The function of F040 = 13 is suitable for synchronous link-up operation. The master frequency is set by CI input. The analog signal of VI is used as compensation value. When input maximum value of VI, the variation rate is：+(F015×F070). When input minimum value of CI, the variation rate is: －(F015×F070). The typical application is as the following diagram shows: The master speed is set by CI. When motor2 speed is different from motor1, speed monitor will modify the value of VI to make the two motors run at the same speed.

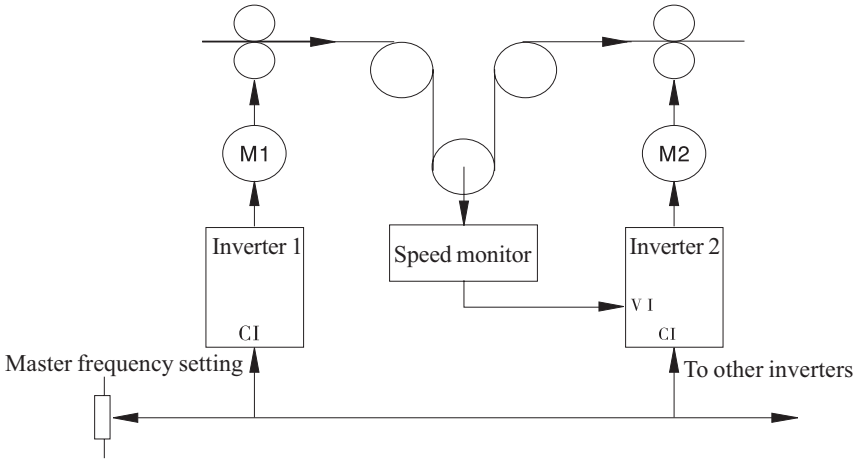


Figure 5.16

F040	Frequency Setting
14~16	Reserved

F040	Frequency Setting
17	Similar to F040 = 1. But motor still runs at low speed when output frequency is lower than F016.

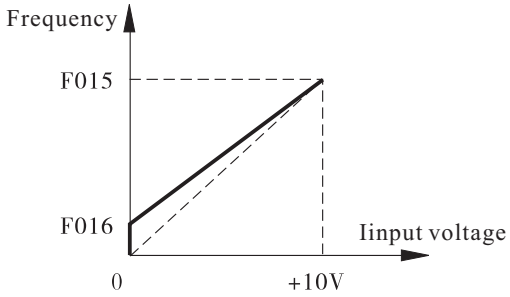


Figure 5.17

Notice:

If necessary, modify the analog input range by setting F089 and F090.

F040	Frequency Setting
18	Similar to F040 = 2. But motor still runs at low speed when output frequency is lower than F016.

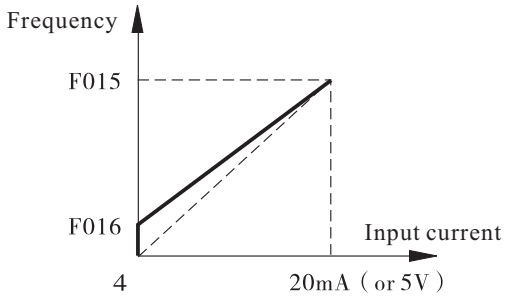


Figure 5.18

Notice:

If necessary, modify the analog input range by setting F091 and F092.

F040	Frequency Setting
19	Similar to F040 = 11. But the modified value of counter can be written in F000 automatically.

F040	Frequency Setting
20	Similar to F040 = 18. But the definition of low speed and high speed is contrary to F040 = 18.

Set F040 to 20. The output frequency is set by CI and run direction is set by F039. When input maximum value of CI, motor runs forward at the frequency set by F016. When input minimum value of CI, motor runs at the frequency set by F015.

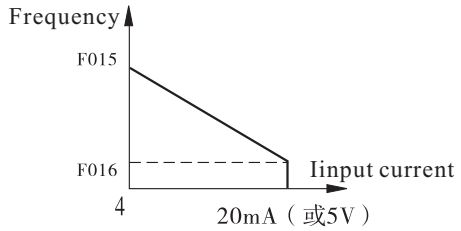


Figure 5.19

Notice:

If necessary, modify the analog input range by setting F091 and F092.

F040	Frequency Setting
21	Frequency setting value = panel setting value×（1 ±(F070×CI)).

Similar to F040 = 12. But the master frequency is set by panel or computer. The function is suitable for link-up control of multi-inverter by computer. When input maximum value of CI, the variation rate is：100%+F070. When input minimum value of CI, the variation rate is: 100%－F070. When output frequency is lower than F016, motor still runs at low speed. Compare the following diagram with Figure 5.15.

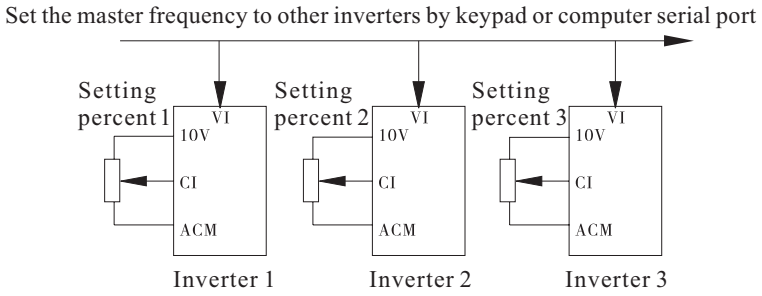


Figure 5.20

F040	Frequency Setting
22	Frequency setting value = panel setting value ±(F015×(F070×VI)). But motor still runs at low speed when output frequency is lower than F016.

Similar to F040 = 13. But the master frequency is set by panel or computer. The analog signal of VI is used as compensation value. When input maximum value of VI, the variation rate is：+(F015× F070). When input minimum value of CI, the variation rate is: －(F015× F070). Compare the following diagram with **Figure 5.16.**

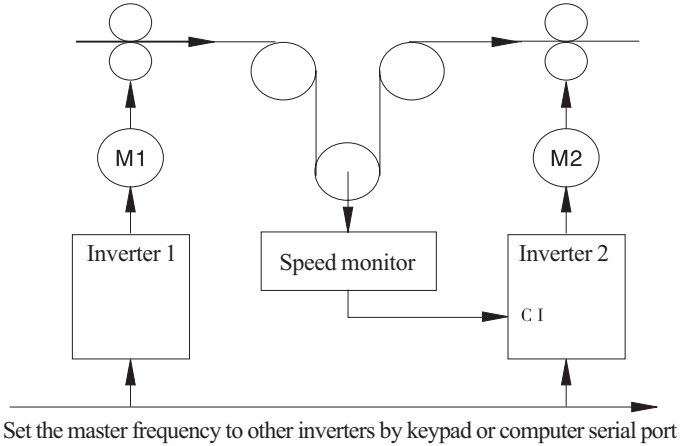


Figure 5.21

F040	Frequency Setting
23~24	Reserved

F040	Frequency Setting
25	Similar to F040 = 2. But output frequency is set by terminal DI. (factory setting: set by potentiometer knob)

Notice:

If necessary, modify the input range of DI by setting F091 and F092.

F040	Frequency Setting
26	Similar to F040 = 5. But both output frequency and run direction are set by terminal DI.
27	Similar to F040 = 26. But motor still runs at low speed when output frequency is lower than F016.
28	Similar to F040 = 12. Frequency setting value = VI × (100% ± (F070 × DI))
29	Similar to F040 = 12. Frequency setting value = DI × (100% ± (F070 × VI))
30	Similar to F040 = 2. Set by terminal DI. But motor still runs at low speed when output frequency is lower than F016.

Notice:

If necessary, modify the input range of DI by setting F091 and F092. Analog input voltage range: 0~+5V.

F040	Frequency Setting
31	Similar to F040 = 30. But the definition of low speed and high speed is contrary to F040 = 30.

When input maximum value of DI, motor runs forward at the frequency set by F016. When input minimum value of DI, motor runs reversely at the frequency set by F015.

F040	Frequency Setting
32	Similar to F040 = 20. But the definition of low speed and high speed is contrary to F040 = 20.

The output frequency is set by VI and run direction is set by F039. When input maximum value of VI, motor runs forward at the frequency set by F016. When input minimum value of VI, motor runs at the frequency set by F015.

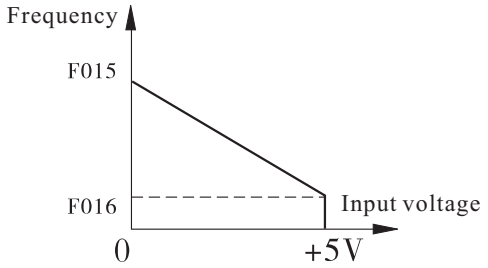


Figure 5.22

Notice:

If necessary, modify the analog input range by setting F089 and F090.

F040	Frequency Setting
33	Similar to F040 = 21. Frequency setting value = panel setting value × (1 ± (F070 × VI)).
34	Similar to F040 = 21. Frequency setting value = panel setting value × (1 ± (F070 × DI)).
35	Similar to F040 = 21. Frequency setting value = panel setting value ± (F015 × (F070 × CI)). But motor still runs at low speed when output frequency is lower than F016.
36	Frequency setting value = panel setting value ± (F015 × (F070 × DI)). But motor still runs at low speed when output frequency is lower than F016.

F040	Frequency Setting
37	FWD run controlled by terminal VI. Similar to F040 = 17. REV run controlled by terminal CI. Similar to F040 = 18.
38	FWD run controlled by terminal CI. Similar to F040 = 18. REV run controlled by terminal VI. Similar to F040 = 17.

F040	Frequency Setting
39	Similar to F040 = 0. But motor still runs at low speed when output frequency is lower than F016.
40	Set by PID output. Refer to **Chapter 7**.
41~45	Reserved
46	Set by RS485 port. Refer to **Chapter 7**.
47	Reserved

F040	Frequency Setting	
48	Frequency setting value = PID gain × (PID output + PID bias voltage × VI).	Refer to **Chapter 7**.
49	Frequency setting value = PID gain × (PID output + PID bias voltage × CI).	
50	Frequency setting value = PID gain × (PID output + PID bias voltage × DI).	
51	Frequency setting value = PID gain × (PID output + PID bias voltage × F028).	

5.4 MULTI–FUNCTION DIGITAL INPUT TERMINAL SETTING

5.4.1 Function Code Corresponding to Multi–function Digital Input Terminal

The multi-function digital input terminals include MI1~MI6. The relative Function Code is as follows:

Function Code	Description
F003	Define the function of terminal FWD
F004	Define the function of terminal REV
F041	Define the function of terminal MI1
F042	Define the function of terminal MI2
F043	Define the function of terminal MI3
F044	Define the function of terminal MI4

Notice:

- **Terminal FWD and REV of control circuit are corresponding to MI5 and MI6.**
- **MIn description: n=1~6, that means MI1 to MI6**

5.4.2 Multi–function Digital Input Terminal Setting Table

F003, F004, F041~F044	Function Indication Abbrev.	Description
0	NULL	Disabled
1	EMS	Emergency stop
2	SPD3	Run at preset frequency of stage 3
3	SPD2	Run at preset frequency of stage 2
4	SPD1	Run at preset frequency of stage 1
5	JOG	Run at preset jog frequency

F003, F004, F041~F044	Function Indication Abbrev.	Description
6	OH	Motor overheat protection (Normal Open: N.O)
7	TMIA	Counter or timer input (time-delay open)
8	ON_BB	Pause and speed tracing (action when circuit closed)
9	FJR	Jog run forward
10	RJR	Jog run reversely
11	TMIB	Counter or timer input (time-delay closed)
12~14	Reserved	
15	U/D CLEAR	Write the value of F016 into counter
16	U/D LOAD	Write the value of F015 into counter
17	U/D HOLD	Counter keep on
18	OFF_BB	Pause and speed tracing (action when circuit open)
19	UP	Counter increase
20	DOWN	Counter decrease
21	ALARM CLEAR	Malfunction reset
22	SET1 (FF1)	Trigger1 setting
23	CLR1 (FF1)	Trigger1 clearance
24	SET2 (FF2)	Trigger 2 setting
25	CLR2 (FF2)	Trigger2 clearance
26	SET (FF1 & FF2)	Set trigger 1 and trigger 2 at the same time
27	CLR (FF1 & FF2)	Clear trigger 1 and trigger 2 at the same time
28	CLK	Input pulse of counter or timer
29	Reserved	

F003, F004, F041~F044	Function Indication Abbrev.	Description
30	OH	Motor overheat protection (Normal Closed: N.C)
31	Normal/Auto SW	Switch between normal run and auto run
32~35	Reserved	
36	TMIC	Counter or timer input (circulation of open and close)
37~47	Reserved	
48	Speed Hold	Run at original speed
49	Reserved	
50	PID Enable	PID enabled
51	PID Hold	PID hold
52	PID Clear	PID Clear
53	PID Preset	PID Preset
54	PID Bias	PID Bias
55	PID Boost	PID Boost
56~68	Reserved	
69	DC-BRAKE1	DC brake voltage set by VI
70	DC-BRAKE2	DC brake voltage set by CI
71	DC-BRAKE3	DC brake voltage set by DI
72	SENSOR_LESS SELECTION	Vector control switch
73	RWD FUNCTION	Run forward
74	REV FUNCTION	Run reversely
75	POWER_CONT-ROL SELECTION	Output power restriction source selection

F003, F004, F041~F044	Function Indication Abbrev.	Description
76	FORWARD INHIBIT	Prohibit forward run
77	REVERSE INHIBIT	Prohibit reverse run
78	PANEL SET UP	Increase frequency by panel
79	PANEL SET DOWN	Decrease frequency by panel
80	SPEED1	8-step speed selection
81	SPEED2	
82	Reserved	
83	SPEED3	
84	JOG ACCEL. / DECEL. TIME	Acceleration/ deceleration time selection
85	SPD1 ACCEL. / DECEL. TIME	
86	SPD2ACCEL. / DECEL. TIME	
87	SPD3 ACCEL. / DECEL. TIME	
88	SPEED COMM-AND SW	Speed command switch
89	CONTROL COM-MAND SW	Control command switch
90	SPEED & CON-TROL SW	Speed source and control command selection
91	/TMIA	Counter or timer reverse input (time-delay open)
92	/TMIB	Counter or timer reverse input (time-delay closed)
93	/TMIC	Counter or timer reverse input (circulation of open and close)

F003, F004, F041~F044	Function Indication Abbrev.	Description
94	TMIAX	Similar to MIn = 7. time relay = F071×CI
95	TMIBX	Similar to MIn = 11. time relay = F071×CI
96	TMICX	Similar to MIn = 36. time relay = F071×CI
97	/TMIAX	Similar to MIn = 91. time relay = F071×CI
98	/TMIBX	Similar to MIn = 92. time relay = F071×CI
99	/TMICX	Similar to MIn = 93. time relay = F071×CI

5.4.3 MIn Setting Value Description

MIn	Function Indication Abbrev.	Description
0	NULL	Disabled

No matter ON or OFF of terminal MIn, the input function is disabled.

MIn	Function Indication Abbrev.	Description
1	EMS	Emergency stop

When input terminal is ON, inverter will output DC voltage to motor instead of AC voltage. This function can make motor stop quickly. Refer to descriptions of F005~F008.

MIn	Function Indication Abbrev.	Description
2	SPD3	Run at preset frequency of stage 3
3	SPD2	Run at preset frequency of stage 2
4	SPD1	Run at preset frequency of stage 1
5	JOG	Run at preset jog frequency

When speed is set by input terminal, the sequence is as following:
Jog run speed> speed1> speed 2> speed3> 8-step speed> normal speed

Notice:

The above function takes effect when input run command. When MIn = 9 and MIn = 10, jog run doesn't need additional run command signal.

MIn	Function Indication Abbrev.	Description
6	OH	Motor overheat protection (Normal Open: N.O)

When input terminal circuit is open, inverter works normally. When input terminal circuit is closed, inverter stops output and displays OH malfunction.

MIn	Function Indication Abbrev.	Description
7	TMIA	Counter or timer input (time-delay open)

When use timer, the signal of preset 0.1 second is used as input signal of timer. When use counter, MI2 (the value is preset to 28) will be used as the input pulse terminal. If want to modify this function manually, refer to MIn= 94~99 descriptions.

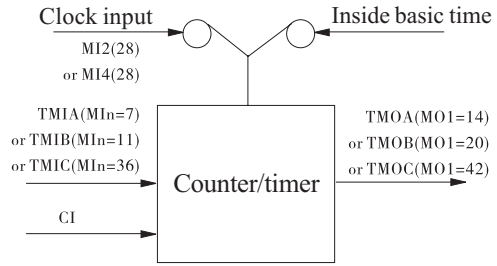


Figure 5.23

Notice:

- **Inverter has only one module with the function of timer and counter. When MI2 is set to 28, only counter function is activated. Otherwise it will be used as timer.**
- **The maximum pulse rate of counter/timer is 1000Hz.**

When one of terminal MIn is assigned to TMIA function, select MO1 or A~B, C~D as output function of TMOA. Together with the inside timer, these compose a time-delay closed relay. And the delay time is set by F071.

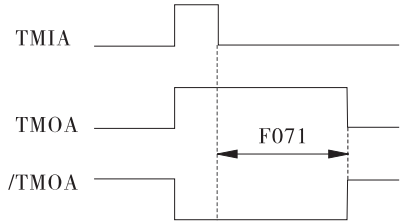


Figure 5.24

When input TMIA is ON, output TMOA is ON too. When TMIA is OFF, TMOA is OFF after the delay time set by F071 is over.

MIn	Function Indication Abbrev.	Description
8	ON_BB	Pause and speed tracing (action when circuit closed)

When the selected input terminal is ON, all IGBT stops output. When input terminal restores to OFF, inverter starts the function of tracing speed after the pending time (set by F036) is over.

MIn	Function Indication Abbrev.	Description
9	FJR	Jog run forward

When the selected input terminal is ON, inverter will be switched to run forward at jog frequency.

MIn	Function Indication Abbrev.	Description
10	RJR	Jog run reversely

When the selected input terminal is ON, inverter will be switched to run reversely at jog frequency.

MIn	Function Indication Abbrev.	Description
11	TMIB	Counter or timer input (time-delay closed)

Refer to MIn = 7.

When one of terminal MIn is assigned to TMIB function, select MO1 or A~B, C~D as output function of TMOB. Together with the inside timer, these compose a time-delay closed relay. And the delay time is set by F071.

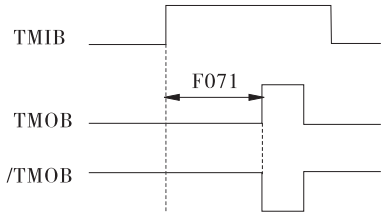


Figure 5.25

When input TMIB is OFF, output TMOB is OFF too. When TMIB is ON, TMOB is ON after the delay time set by F071 is over.

MIn	Function Indication Abbrev.	Description
12~14	Reserved	
15	U/D CLEAR	Write the value of F016 into counter
16	U/D LOAD	Write the value of F015 into counter
17	U/D HOLD	Counter keep on

When the selected input terminal is ON and the value is set to the above number, the corresponding function will start.

Notice:

When use counter/timer to set frequency, F040 must be set to one of 6, 7, 11 and 19. Refer to F040 descriptions.

MIn	Function Indication Abbrev.	Description
18	OFF_BB	Pause and speed tracing (action when circuit open)

When the selected input terminal is OFF, all IGBT stops output. When input terminal is ON, inverter starts the function of tracing speed after the pending time (set by F036) is over.

MIn	Function Indication Abbrev.	Description
19	UP	Counter increase

When the selected input terminal is ON, counter increases according to the acceleration time of F001.

MIn	Function Indication Abbrev.	Description
20	DOWN	Counter decrease

When the selected input terminal is ON, counter decreases according to the deceleration time of F001.

MIn	Function Indication Abbrev.	Description
21	ALARM CLEAR	Malfunction reset

This function only takes effect when inverter once has malfunction. If inverter works normally, this function is disabled.

Notice:

Standard RST terminal can be used to reset inverter no matter whether malfunction occurs.

MIn	Function Indication Abbrev.	Description
22	SET1 (FF1)	Trigger1 setting
23	CLR1 (FF1)	Trigger1 clearance
24	SET2 (FF2)	Trigger 2 setting
25	CLR2 (FF2)	Trigger2 clearance
26	SET (FF1 & FF2)	Set trigger 1 and trigger 2 at the same time
27	CLR (FF1 & FF2)	Clear trigger 1 and trigger 2 at the same time

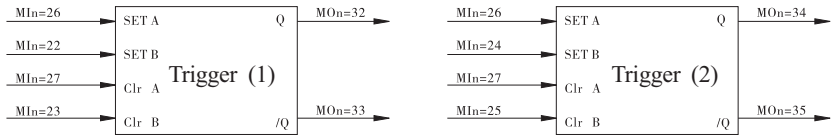


Figure 5.26 trigger function diagram

As Figure 5.26 shows, every trigger can be set by two input terminals and can be monitored by two output terminals MO1 or A~B, C~D.

As the following Figure 5.27 shows, the inside trigger and terminal MI1, MI2, MO1 compose a circulation circuit.

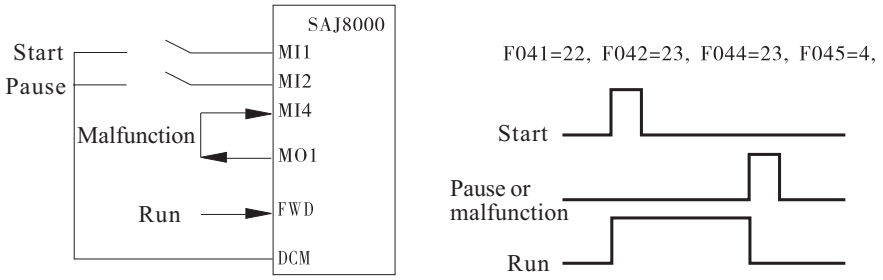


Figure 5.27

MIn	Function Indication Abbrev.	Description
28	CLK	InputInput pulse of counter or timer

When MI1 = 28, the function is reserved. When MI2 = 28, only counter function is enabled. Refer to MIn =7, MIn = 11 and MIn = 36.

MIn	Function Indication Abbrev.	Description
29	Reserved	
30	OH	Motor overheat protection (Normal Closed: N.C)

When input terminal circuit is Open, inverter stops output and displays OH malfunction.

MIn	Function Indication Abbrev.	Description
31	Normal/Auto SW	Switch between normal run and auto run

Usually, set F072 to 0 if normal run mode is needed. When need to switch between normal run mode and auto run mode, set F072 to auto run mode. And then switch the mode manually by setting input terminal. Thus the frequent modification operation of F072 can be avoided.

If selected input terminal is OFF, auto run function takes effect according the setting by F072. If selected input terminal is ON, it will restore to normal run no matter how to set F072. This is similar to F072 = 0.

MIn	Function Indication Abbrev.	Description
32~35	Reserved	
36	TMIC	Counter or timer input (circulation of open and close)

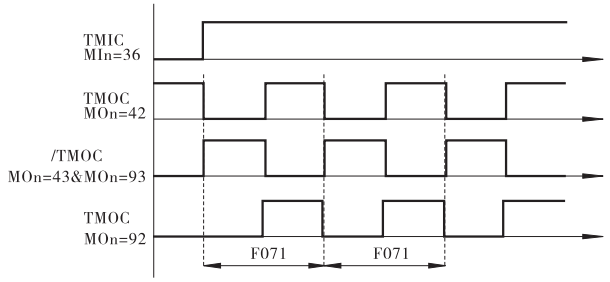


Figure 5.28

When input TMIC is OFF, TMOC output keeps ON. When MO1 = 92, TMOC output keeps OFF. When input TMIC is ON, TMOC output starts to switch between ON and OFF according to the time set by F071. The ON time is equal to the OFF time. Refer MIn = 94.

MIn	Function Indication Abbrev.	Description
37~47	Reserved	
48	Speed Hold	Run at original speed

When MIn = 48 and the selected input terminal is ON, inverter stops acceleration or deceleration and runs at original frequency. When input terminal is OFF, inverter continues to accelerate or decelerate.

MIn	Function Indication Abbrev.	Description
49	Reserved	
50	PID Enable	PID enabled
51	PID Hold	PID hold
52	PID Clear	PID Clear
53	PID Preset	PID Preset
54	PID Bias	PID Bias
55	PID Boost	PID Boost

Refer to PID function description of **Chapter 7**.

MIn	Function Indication Abbrev.	Description
56~68	Reserved	
69	DC-BRAKE1	DC brake voltage set by VI
70	DC-BRAKE2	DC brake voltage set by CI
71	DC-BRAKE3	DC brake voltage set by DI

When MIn = 69, 70 or 71, and the selected input terminal is ON, inverter outputs DC voltage to motor. The DC voltage is set by VI, CI or DI.

Notice:

DC brake voltage = F006×Vn (Vn is voltage value of VI, CI or DI)

MIn	Function Indication Abbrev.	Description
72	SENSOR_LESS SELECTION	Vector control switch

When F067 = 1 and input terminal is OFF, inverter working mode switches to vector control mode. When F067 = 3 and input terminal is OFF, inverter working mode switches to common V/F control mode.

MIn	Function Indication Abbrev.	Description
73	RWD FUNCTION	Run forward
74	REV FUNCTION	Run reversely

Refer to F003 and F004 descriptions.

MIn	Function Indication Abbrev.	Description
75	POWER_CONTROL SELECTION	Output power restriction source selection

This function is only enabled when F067 = 4. When MIn = 75 and input terminal is ON, power restriction curve is set by CI. Otherwise, power restriction curve is set by DI.

MIn	Function Indication Abbrev.	Description
76	FORWARD INHIBIT	Prohibit forward run
77	REVERSE INHIBIT	Prohibit reverse run

When the selected input terminal is ON, the above functions are enabled.

MIn	Function Indication Abbrev.	Description
78	PANEL SET UP	Increase frequency by panel
79	PANEL SET DOWN	Decrease frequency by panel

Refer to F040 = 8.

MIn	Description
80~83	8-step speed selection

When MIn = 80~83 and all selected terminals are ON, frequency setting value = MIn (83) ×F027+MIn(82) ×F024+MIn(81) ×F021+MIn(80) ×F019.

MIn	Description
84~87	Acceleration/ deceleration time selection

When MIn =84 and the selected input terminal is ON, accel./decel. time is set by F020.

When MIn =85 and the selected input terminal is ON, accel. time is set by F022 and decel. time is set by F023.

When MIn =86 and the selected input terminal is ON, accel. time is set by F025 and decel. time is set by F026.

When MIn =87 and the selected input terminal is ON, accel. time is set by F028 and decel. time is set by F029.

MIn	Description
88~90	Speed control and command selection

Refer to F039 and F040 descriptions. F039 = X.Y and F040 = XX.YY.

When MIn =88 and the selected input terminal is ON, speed source is set by YY.

When MIn =88 and the selected input terminal is OFF, speed source is set by XX.

When MIn =89 and the selected input terminal is ON, control command is set by Y.

When MIn =89 and the selected input terminal is OFF, control command is set by X.

When MIn =90 and the selected input terminal is ON, speed source is set by YY and control command is set by Y. When MIn =90 and the selected input terminal is OFF, speed source is set by XX and control command is set by X.

Notice:

When MIn = 90, MIn = 88 and MIn = 89 are disabled.

MIn	Function Indication Abbrev.	Description
91	/TMIA	Counter or timer reverse input (time-delay open)
92	/TMIB	Counter or timer reverse input (time-delay closed)
93	/TMIC	Counter or timer reverse input (circulation of open and close)

Refer to MIn = 7, 11, 36 descriptions.

MIn	Description
94~99	Adjustable timer setting

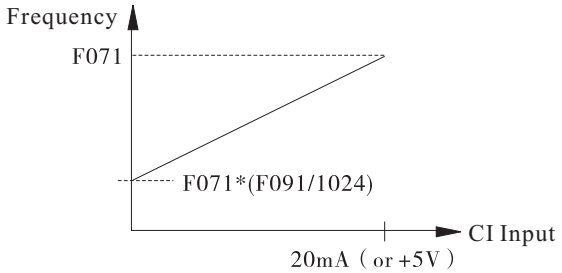


Figure 5.29

5.5 DIGITAL OUTPUT TERMINAL SETTING

5.5.1 Function Code Corresponding to Digital Output Terminal

Function Code	Description
F045	Define the output function of terminal MO1
F047	Define the output function of terminal A and B
F046	Define the output function of terminal C and D

5.5.2 Digital Output Terminal Function Setting Table

F045, F046, F047	Function Indication Abbrev.	Description
0	OFF	Disabled
1	STOP	Inverter stops working
2	SPE	Output frequency is the same
3	SPNE	Output frequency is different
4	ALM	Malfunction
5	NALM	No malfunction
6	BRAKING	During braking
7	RUNNING	Inverter works normally
8	SPO	Output frequency surpass
9	SPNO	Output frequency not surpass
10	SPA	Output frequency arrive
11	SPNA	Output frequency not arrive
12	DIR	Run direction
13	Irms LEVELO	Irms >F048
14	TMOA	Timer output (time-delay open)
15	SPZ	Zero speed at output frequency
16	SPNZ	Not zero speed at output frequency
17	STALLING	Stall prevention
18~19	Reserved	

F045, F046, F047	Function Indication Abbrev.	Description
20	TMOB	Timer output (time-delay closed)
21~30	STEP1~STEP10	Auto run at step 1~step 10
31	Reserved	
32	Trigger 1 output	
33	Trigger 1 output reversely	
34	Trigger 2 output	
35	Trigger 2 output reversely	
36~37	Reserved	
38	Output often ON	
39	Reserved	
40	TMOA timer output reversely (time-delay open)	
41	TMOB timer output reversely (time-delay closed)	
42	TMOC on/off circulation timer	
43	TMOC on/ff circulation timer output reversely	
44	×32CLK output pulse frequency = 32×F057	
45	×16CLK output pulse frequency = 16×F057	
46	×8CLK output pulse frequency = 8×F057	
47	×4CLK output pulse frequency = 4×F057	
48	×2CLK output pulse frequency = 2×F057	
49	×1CLK output pulse frequency = 1×F057	
50~53	Reserved	
54	Irms LEVEL1	Irms>VI
55	Irms LEVEL2	Irms>CI
56	Irms LEVEL3	Irms>DI
57	Power-Limit	Output power is limited
58~69	Reserved	
70	RUN& (VI>F074)	Compare with F074 during running

F045, F046, F047	Function Indication Abbrev.	Description
71	RUN& (VI<F074)	Compare with F074 during running
72	RUN& (CI>F075)	Compare with F075 during running
73	RUN& (CI<F075)	Compare with F075 during running
74	RUN& (DI>F076)	Compare with F076 during running
75	RUN& (DI<F076)	Compare with F076 during running
76~77	Reserved	
78	OL-WARNING	Overload>50%
79	OL-WARNING	Overload<50%
80	VI>F074	Compare with F074
81	VI<F074	Compare with F074
82	CI>F075	Compare with F075
83	CI<F075	Compare with F075
84	DI>F076	Compare with F076
85	DI<F076	Compare with F076
86	ACC	During acceleration
87	DEC	During deceleration
88	DISCHARGE	During discharge
89	Reserved	
90	FWD	Forward run
91	REV	Reversal run
92	TMOC	Similar to Mon = 42, enabled when TMIC is ON
93	/TMOC	Similar to Mon = 43

5.5.3 Descriptions

F045, F046, F047	Function Indication Abbrev.	Description
0	OFF	Disabled

When the parameter is set to 0, the selected output terminal function is disabled.

F045, F046, F047	Function Indication Abbrev.	Description
1	STOP	Inverter stops working

The selected output terminal is ON when inverter stops working. When inverter restores to work, it is OFF.

Notice:

Inverter still works during DC braking.

F045, F046, F047	Function Indication Abbrev.	Description
2	SPE	Output frequency is the same
3	SPNE	Output frequency is different

Set a frequency value to F049 as target frequency. And then set the frequency error limit in F050. As the following diagram shows:

Set the parameter to 2. When the frequency error between inverter output frequency and F049 is lower than F050, output frequency is defined as the same with F049. And then the selected output terminal is ON. When set the parameter to 3, the function is opposite.

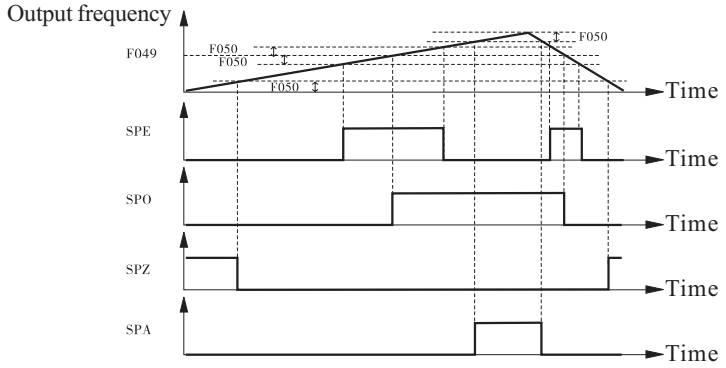


Figure 5.30

F045, F046, F047	Function Indication Abbrev.	Description
4	ALM	Malfunction

When inverter works normally, the selected output terminal is OFF. When malfunction occurs, it is ON.

F045, F046, F047	Function Indication Abbrev.	Description
5	NALM	No malfunction

When inverter works normally, the selected output terminal is ON. When malfunction occurs, it is OFF.

F045, F046, F047	Function Indication Abbrev.	Description
6	BRAKING	During braking

When inverter starts DC braking, the selected output terminal is ON. Otherwise it is OFF.

F045, F046, F047	Function Indication Abbrev.	Description
7	RUNNING	Inverter works normally

When the status of inverter is running, the selected output terminal is ON. Otherwise it is OFF.

F045, F046, F047	Function Indication Abbrev.	Description
8	SPO	Output frequency surpass
9	SPNO	Output frequency not surpass

Refer to **Figure 5.30.** Set the parameter to 8. When output frequency surpasses F049, the selected output terminal is ON. When set the parameter to 9, the function is opposite.

F045, F046, F047	Function Indication Abbrev.	Description
10	SPA	Output frequency arrive
11	SPNA	Output frequency not arrive

Refer to **Figure 5.30.** Set the parameter to 10. When the frequency error is lower than F050, output frequency is defined as arriving. And then the selected output terminal is ON. When set the parameter to 11, the function is opposite.

F045, F046, F047	Function Indication Abbrev.	Description
12	DIR	Run direction

When inverter outputs forward run signal, the selected output terminal is ON. When inverter outputs reversal run signal, the selected output terminal is OFF.

Notice:

In such case, the selected output terminal is ON when inverter stops output.

F045, F046, F047	Function Indication Abbrev.	Description
13	Irms LEVELO	Irms >F048

When inverter output current Irms is larger than F048, the selected output terminal is ON.

F045, F046, F047	Function Indication Abbrev.	Description
14	TMOA	Timer output (time-delay open)
15	SPZ	Zero speed at output frequency
16	SPNZ	Not zero speed at output frequency

Refer to **Figure 5.30.** When the frequency error is lower than F050, output frequency is defined as zero speed. And then the selected output terminal is ON. Otherwise the function is opposite.

F045, F046, F047	Function Indication Abbrev.	Description
17	STALLING	Stall prevention

When output current exceeds the upper limit, inverter will decrease the output frequency for the purpose of stall prevention. The selected output terminal is ON during deceleration process.

F045, F046, F047	Function Indication Abbrev.	Description
18~19	Reserved	
20	TMOB	Timer output (time-delay closed)

Refer to Section 5.4.3

F045, F046, F047	Function Indication Abbrev.	Description
21~30	STEP1~STEP10	Auto run at step 1~step 10

F045, F046, F047	Function Indication Abbrev.	Description
31~35	Trigger function	

Refer to MIn = 22.

F045, F046, F047	Function Indication Abbrev.	Description
36~37	Reserved	
38	Output often ON	

Refer to F045~F047 = 0.

F045, F046, F047	Function Indication Abbrev.	Description
39	Reserved	
40	TMOA timer output reversely (time-delay open)	
41	TMOB timer output reversely (time-delay closed)	
42	TMOC on/off circulation timer	
43	TMOC on/ff circulation timer output reversely	

Refer to MIn = 7 and MIn = 36.

F045, F046, F047	Function Indication Abbrev.	Description
44~49	Output pulse frequency setting mode	

Output pulse frequency setting function is valid only by selecting terminal MO1. Reset the inverter to start MICLK function when use this function. When MICLK function is changed, reset the inverter too.

F045, F046, F047	Function Indication Abbrev.	Description
50~53	Reserved	

F045, F046, F047	Function Indication Abbrev.	Description
54	Irms LEVEL1	Irms>VI

When output current (Irms%) > 150%×VI, the selected output terminal is ON.

F045, F046, F047	Function Indication Abbrev.	Description
55	Irms LEVEL2	Irms>CI

When output current (Irms%) > 150%×CI, the selected output terminal is ON.

F045, F046, F047	Function Indication Abbrev.	Description
56	Irms LEVEL3	Irms>DI

When output current (Irms%) > 150%×DI, the selected output terminal is ON.

F045, F046, F047	Function Indication Abbrev.	Description
57	Power-Limit	Output power is limited

Inverter works under output power control (torque control) mode. When output power exceeds the setting upper limit, the selected terminal is ON during decreasing output power.

F045, F046, F047	Function Indication Abbrev.	Description
58~69	Reserved	

F045, F046, F047	Function Indication Abbrev.	Description
70	RUN& (VI>F074)	Compare with F074 during running
71	RUN& (VI<F074)	Compare with F074 during running

When VI > F074 during inverter working process, MOn(70) is ON and Mon(71) is OFF. (F074 value is set between 0.0~1023.0). Set F055 to 3, VI value is monitored by F056.

F045, F046, F047	Function Indication Abbrev.	Description
72	RUN& (CI>F075)	Compare with F075 during running
73	RUN& (CI<F075)	Compare with F075 during running

When CI > F075 during inverter working process, MOn(72) is ON and Mon(73) is OFF. (F075 value is set between 0.0~1023.0). Set F055 to 4, CI value is monitored by F056.

F045, F046, F047	Function Indication Abbrev.	Description
74	RUN& (DI>F076)	Compare with F076 during running
75	RUN& (DI<F076)	Compare with F076 during running

When DI > F076 during inverter working process, MOn(74) is ON and Mon(75) is OFF. (F076 value is set between 0.0~1023.0). Set F055 to 5, DI value is monitored by F056.

F045, F046, F047	Function Indication Abbrev.	Description
76~77	Reserved	
78	OL-WARNING	Overload＞50%
79	OL-WARNING	Overload＜50%

When F054 = 11, the value of OL (over load) can be monitored by F061. Set the parameter to 78, the selected output terminal is ON when OL value ＞50%. Set the parameter to 79, the selected output terminal is ON when OL value ＜50%.

F045, F046, F047	Function Indication Abbrev.	Description
80	VI＞F074	Compare with F074
81	VI＜F074	Compare with F074

When VI ＞ F074, MOn(80) is ON and Mon(81) is OFF. (F074 value is set between 0.0~1023.0). Set F055 to 3, VI value is monitored by F056.

F045, F046, F047	Function Indication Abbrev.	Description
82	CI＞F075	Compare with F075
83	CI＜F075	Compare with F075

When CI ＞ F075, MOn(82) is ON and Mon(83) is OFF. (F075 value is set between 0.0~1023.0). Set F055 to 4, CI value is monitored by F056.

F045, F046, F047	Function Indication Abbrev.	Description
84	DI＞F076	Compare with F076
85	DI＜F076	Compare with F076

When DI ＞ F076 during inverter working process, MOn(84) is ON and Mon(85) is OFF. (F076 value is set between 0.0~1023.0). Set F055 to 5, DI value is monitored by F056.

F045, F046, F047	Function Indication Abbrev.	Description
86	ACC	During acceleration

The selected output terminal is ON during inverter acceleration process.

F045, F046, F047	Function Indication Abbrev.	Description
87	DEC	During deceleration

The selected output terminal is ON during inverter deceleration process.

F045, F046, F047	Function Indication Abbrev.	Description
88	DISCHARGE	During discharge

The selected output terminal is ON during inverter discharge process.

F045, F046, F047	Function Indication Abbrev.	Description
89	Reserved	

F045, F046, F047	Function Indication Abbrev.	Description
90	Forward	Forward run

The selected output terminal is ON when inverter outputs forward running signal.

F045, F046, F047	Function Indication Abbrev.	Description
91	REV	Reversal run

The selected output terminal is ON when inverter outputs reversal running signal.

F045, F046, F047	Function Indication Abbrev.	Description
92	TMOC	Similar to Mon = 42, enabled when TMIC is ON
93	/TMOC	Similar to Mon = 43

Refer to MIn = 36 and MIn = 42.

5.6 SIMPLE PLC AUTORUN FUNCTION

5.6.1 Simple PLC Autorun Selection Table

Function Code	Selection
F072	Simple PLC function autorun selection
F073	Autorun time setting at step 1 and step 6
F074	Autorun time setting at step 2 and step 7
F075	Autorun time setting at step 3 and step 8
F076	Autorun time setting at step 4 and step 9
F077	Autorun time setting at step 5 and step 10

5.6.2 Simple PLC Function Descriptions Set by F072 Table

F072	Function Descriptions
0	Simple PLC function disabled
1	Keep constant speed after staged autorun
2	Stop and start, repeat after staged autorun
3	Stop and reversal run after staged autorun
4	Autorun repeat after staged autorun
5	Reversal run after staged autorun
6	Similar to F072 = 4. But start from step 2.

Refer to MIn = 31. Simple PLC autorun and normal run can be switched by setting digital input terminals.

5.6.3 Simple PLC Function Descriptions

F072	Function Descriptions
1	Keep constant speed after staged autorun

Step 1: inverter runs at jog frequency and running time is set by F073.

Step 2: inverter runs at step1 frequency and running time is set by F074.

Step 3: inverter runs at step2 frequency and running time is set by F075.

Step 4: inverter runs at step3 frequency and running time is set by F076.

Step 5: inverter runs at master frequency which is set by F040.

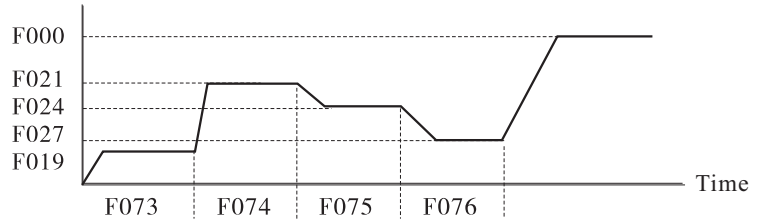


Figure 5.31

F072	Function Descriptions
2	Stop and start, repeat after staged autorun

Step 1: inverter runs at jog frequency and running time is set by F073.

Step 2: inverter runs at step1 frequency and running time is set by F074.

Step 3: inverter runs at step2 frequency and running time is set by F075.

Step 4: inverter runs at step3 frequency and running time is set by F076.

Step 5: inverter stops working and the stop time is set by F077.

After step5 is finished, repeat the process from step1.

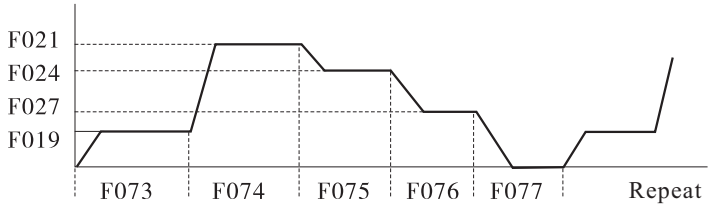


Figure 5.32

F072	Function Descriptions
3	Stop and reversal run after staged autorun

Step 1: inverter runs at jog frequency and running time is set by F073.
Step 2: inverter runs at step1 frequency and running time is set by F074.
Step 3: inverter runs at step2 frequency and running time is set by F075.
Step 4: inverter runs at step3 frequency and running time is set by F076.
Step 5: inverter stops working and the stop time is set by F077.

After step5 is finished, inverter works reversely as the following steps show:

Step 6: inverter runs at jog frequency and running time is set by F073.
Step 7: inverter runs at step1 frequency and running time is set by F074.
Step 8: inverter runs at step2 frequency and running time is set by F075.
Step 9: inverter runs at step3 frequency and running time is set by F076.
Step 10: inverter stops working and the stop time is set by F077.

After step10 is finished, inverter repeats to work reversely from step1.

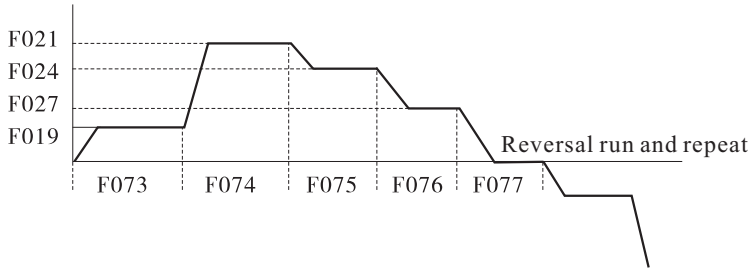


Figure 5.33

F072	Function Descriptions
4	Autorun repeat after staged autorun

Similar to F072 = 2. But step5 is different.
Step 1: inverter runs at jog frequency and running time is set by F073.
Step 2: inverter runs at step1 frequency and running time is set by F074.
Step 3: inverter runs at step2 frequency and running time is set by F075.
Step 4: inverter runs at step3 frequency and running time is set by F076.
Step 5: inverter runs at the master frequency set by F040 and the stop time is set by F077
After step5 is finished, repeat the process from step1.

F072	Function Descriptions
5	Reversal run after staged autorun

Similar to F072 = 3. But step5 and step10 are different.
Step 1: inverter runs at jog frequency and running time is set by F073.
Step 2: inverter runs at step1 frequency and running time is set by F074.
Step 3: inverter runs at step2 frequency and running time is set by F075.
Step 4: inverter runs at step3 frequency and running time is set by F076.
Step 5: inverter runs at the master frequency set by F040 and the stop time is set by F077.

After step5 is finished, inverter works reversely as the following steps show:

Step 6: inverter runs at jog frequency and running time is set by F073.
Step 7: inverter runs at step1 frequency and running time is set by F074.
Step 8: inverter runs at step2 frequency and running time is set by F075.
Step 9: inverter runs at step3 frequency and running time is set by F076.
Step 10: inverter runs at the master frequency set by F040 and the stop time is set by F077.

After step10 is finished, inverter repeats to work reversely from step1.

F072	Function Descriptions
6	Similar to F072 = 4. But start from step 2.

At first, it is the same with F072 = 4 from step1 to step5. But each time inverter starts to repeat from step2. This process is as follows:
Start: step1→step2→ ⋯⋯step5→step2→ ⋯⋯step5⋯⋯

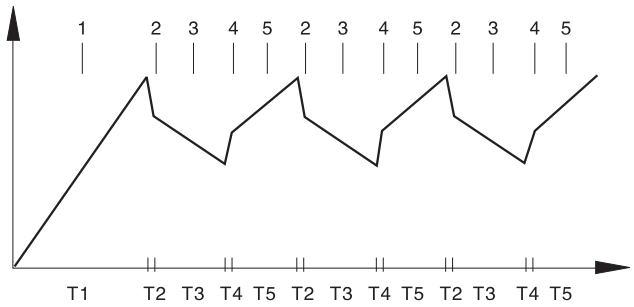


Figure 5.34

5.6.4 Output Signal When Autorun at Special Step

Special function of digital output terminal (MOn) can be selected during autorun process. It can output signal to make inverter in coordination with other outside devices. For example:

If user wants to output signal at step2, step3 and step4 during inverter autorun, the setting method is as follows:

Set F045 to 22, select terminal MO1 enabled at step2.

Set F047 to 23, select terminal A and B enabled at step3.

Set F046 to 24, select terminal C and D enabled at step4.

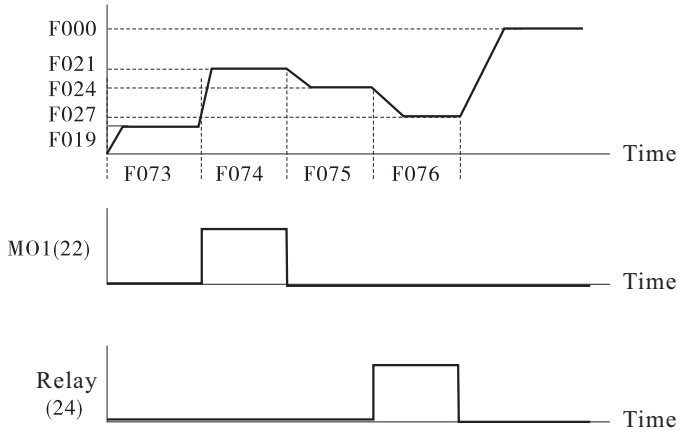


Figure 5.35

6 RS485 AND PID FUNCTION

6.1 RS485 MODBUS(RTU) SERIAL COMMUNICATION DESRIPTION

The Modbus protocol is used to PLC control development environment made by Modicon Company. This PLC software language is used widely as a standard in the world because of its convenience. It is widely used in integration control of main controller and affiliated devices. As the protocol of asynchronous serial communication, the data transmission of Modbus adopts half duplex communication that main station controls one or more of subordinate station. The inverter uses RS485 port as the physical interface of Modbus which has two different transmission methods: ASCII and RTU. The inverter only supports RTU method. About more information of Modbus protocol, please refer to:

1. GB/Z 19582.1-2004 Part One: Application Protocol of Industry Automation Network Specification Based On Modbus.

2. GB/Z 19582.2-2004 Part Two: Practice Instructions of Industry Automation Network Specification Based On Modbus.

6.1.1 Parameter Setting of Communication Port under Modbus Protocol

●F093 = PB. ID

P: communication format B: communication speed ID: communication address

●ID setting range: 01~99

● Communication format is as follows:

Communication format	Descriptions
P = 2	Modbus, no parity, 8 bit binary
P = 3	SAJ8000Modbus, no parity, 8 bit binary

●Communication speed setting table

Communication format	Descriptions
B = 0	4800bps, 2 stop bits
B= 1	9600bps, 2 stop bits
B= 2	19200bps, 2 stop bits
B= 3	Reserved
B= 4	4800bps, 1 stop bits
B= 5	9600bps, 1 stop bits
B= 6	19200bps, 1 stop bits
B= 7	Reserved

6.1.2 Function Code of Modbus Supported by Inverter

01(hex): BIT read

05(hex): BIT write

Of (hex): multiple BIT write

03(hex): WORD read

06(hex): WORD write

03(hex): LONGWORD read

10(hex): LONGWORD write

6.1.3 Command Based on Modbus Protocol

Command	Extended station address.(HEX)	Code number	Start address (HEX)	Data (HEX)	CRC inspection
Reset	01	05	000F	FF00	BC39
Stop	01	06	0042	0000	29DE
FWD run	01	06	0042	0020	2806
REV run	01	06	0042	0040	282E
Jog FWD run	01	06	0042	0002	A81F
Jog REV run	01	06	0042	0004	281D

The communication control of inverter based on Modbus protocol is carried out by setting analog terminal. Thus set the following parameters when use it:

1. Set F039 to 2.0. (Terminal control method)
2. Set F041 to 9 for jog FWD run control.
3. Set F042 to 10 for jog REV run control.

Notice:

When use the above communication control based on Modbus protocol, digital input terminal can't be used for other functions except run control function because of terminal control method. (That means F039 = 1, 2, 3 or 4)

6.1.4 Address Mapping

DI1~DI6 bit1~bit6
D01~D03 bit17~bit19
F000~F099 WORD-00~WORD-99

Example 1: Read the parameter of F000

Set F000 to 50 and inverter address to 01. That means F093 = PB. 01.

Modbus information frame sent: 010300000001840A (hexadecimal).

01: inverter address

03: Modbus code, read register

0000: register start address

0001: register number needed to read

840A: CRC inspection value

Inverter feedback frame: 0103021388B512

01: inverter address

03: Modbus code, read register.

02: byte number

1388: parameter of F000 (hexadecimal)

B512: CRC inspection value

Example 2: Modify the parameter of F000

The written-in parameter is 50(Hz). Set inverter address to 01. That means F093 = PB.01.

Modbus information frame sent: 010600001388849C (hexadecimal).
01: inverter address
0000: register start address
0001: parameter needed to write in
849C: CRC inspection value
Inverter feedback frame: 010600001388849C (same with command frame sent)

Example 3: Reset command
Set inverter address to 01. That means F093 = PB.01.
Modbus information frame sent: 0105000FFF00BC39 (hexadecimal).
01: inverter address
05: Modbus code, single coil forced
000F: coil start address whose corresponding bit address is 0X16
FF00: set coil ON
BC39: CRC inspection value
Inverter feedback frame: 0105000FFF00BC39 (same with the frame sent)

Example 4: FWD run command
Set inverter address to 01. That means F093 = PB.01.
Modbus information frame sent: 0106004200202806 (hexadecimal).
01: inverter address
06: Modbus code, write in register
0042: register address corresponding to F066
0020: FWD run command
2806: CRC inspection value
Inverter feedback frame: 0106004200202806 (same with the frame sent)

6.1.5 Modbus Communication Format

The standard Modbus communication format is put inside the inverter. Inverter can be connected to PC, PLC directly by Modbus communication interface.

6.1.6 RS485 Hardware Interface Specification

The RS485 terminal and jumper connection diagram is as follows:

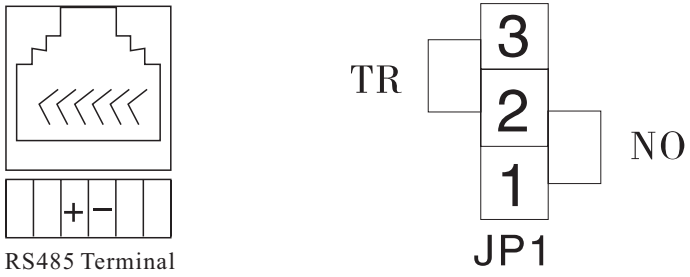


Figure 6.1

- Parallel connection of multi-inverter signal terminals is available by RS485 interface.
- When connected to PC, standard 9-pin DSUB computer joint can be used.

6.2 PID FUNCTION DESCRIPTIONS

PID control theory: The PID inside inverter can compare the inspection value given by control device sensor with system setting value. When there is bias, the feedback value can keep the same with system setting value by PID modulation.

Notice:

When use PID function, the other functions of F073~F77 are disabled.

6.2.1 F073 PID Input Selection

The PID value expression of F073 is X.Y. That means it has two groups of number. X defines the source of system setting value. Y defines the source of PID feedback value. The sources of X and Y are as following table shows:

Communication speed rate	Descriptions
0	Fixed value set by F027 (0.00~100.00%)
1	Analog input VI as source, 0~+5V→0~0x7FFF
2	Analog input CI as source, 4~20mA→4~0 x 7FFF
3	Analog input DI as source, 0~+5V→0~0 x 7FFF
4	Analog input VI as source, +5V ~0→0~0 x 7FFF
5	Analog input CI as source, 20mA~4→0~0 x 7FFF
6	Analog input DI as source, +5V ~0→0~0 x 7FFF
10	MI2(28) pulse input, the calculating method is 0 x 7FFF×(cumulate pulse per 13.2sec./F071)

F028: PID bias voltage setting (0.1~100.0%)

F029: PID gain setting (0.0~500.0%)

F074: PID preset output value (0.1~100.0%)

F075: P gain of PID

F076: I gain of PID

F075: D gain of PID

6.2.2 PID Digital Input Selection

MIn	Function	Descriptions
50	PID function start	When input terminal MIn(50) is ON, PID function starts. When input terminal MIn(50) is OFF, PID function stops.
51	PID cumulative value hold	When MIn(51) is OFF, cumulative value is normal. When MIn(51) is ON, cumulative value is hold.
52	PID cumulative value clearance	When MIn(52) is ON, cumulative value is cleared.
53	PID output value preset	When MIn(53) is ON, preset cumulative value is F074 setting value
54	PID bias voltage start value	When MIn(54) is ON, bias value = bias voltage input start value When MIn(54) is FF, bias value = 0
55	PID gain value	When MIn(55) is ON, PID gain = F029 (0.0~500.0%). When MIn(55) is OFF, PID gain = 100.0%. When MIn(55) is ON, PID output keeps original value.

6.2.3 PID Output Source Selection

F040	Descriptions
40	Frequency setting value = PID output
48	When MIn(54) is ON, frequency setting value= PID gain×(PID output + PID bias×VI). When MIn(54) is OFF, frequency setting value= PID gain.
49	When MIn(54) is ON, frequency setting value= PID gain×(PID output + PID bias×CI). When MIn(54) is OFF, frequency setting value= PID gain.
50	When MIn(54) is ON, frequency setting value= PID gain×(PID output + PID bias×DI). When MIn(54) is OFF, frequency setting value= PID gain.
51	When MIn(54) is ON, frequency setting value= PID gain×(PID output + PID bias×F028). When MIn(54) is OFF, frequency setting value= PID gain.

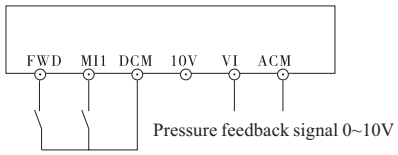
6.2.4 PID Analog Output Function

F037	Terminal FM output	Descriptions
7	PID output	FM = +10V×(PID output)
8	PID+VI bias input	When MIn(54) is ON, FM= +10V×(PID gain×(PID output + PID bias×VI)). When MIn(54) is OFF, FM= +10V×PID output.
9	PID+CI bias input	When MIn(54) is ON, FM= +10V×(PID gain×(PID output + PID bias×CI)). When MIn(54) is OFF, FM= +10V×PID output.
10	PID+DI bias input	When MIn(54) is ON, FM= +10V×(PID gain×(PID output + PID bias×DI)). When MIn(54) is OFF, FM= +10V×PID output.
11	PID+F028 bias input	When MIn(54) is ON, FM= +10V×(PID gain×(PID output + PID bias×F028)). When MIn(54) is OFF, FM= +10V×PID output.

6.2.5 Simple PID Application

1. Set feedback channel as VI (0~10V). The measuring range of pressure gauge is 0~1 Mpa.

2. Connection as following:



Iinverter starts when circuit of FWD and DCM is closed

PID enabled when circuit of MI1 and DCM is closed

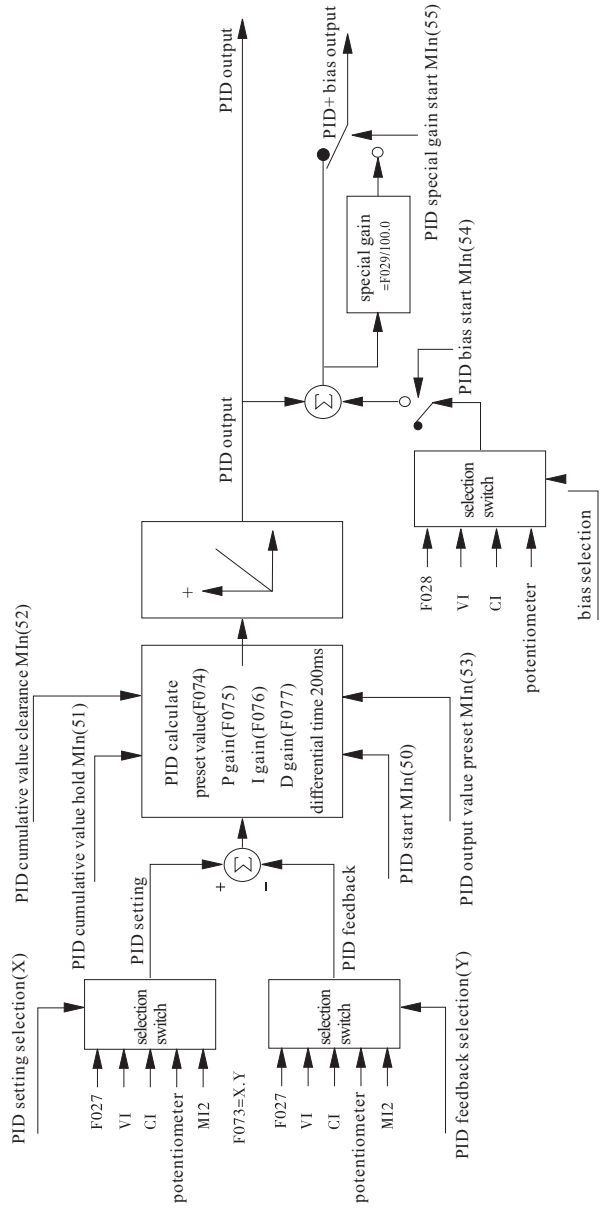
Set F040 to 40, output frequency is set by PID output

3. The parameter setting is as follows:

- Set F039 to 2. (outside terminal control)
- Set F040 to 40. Output frequency is set by PID output. Set F041 to 50. Start PID function (set MI1 to start PID).
- Set F073 = 0.1. 0 stands for PID setting value source (set by F027). 1 stands for PID feedback value source (analog input VI as source).
- Set F027 = 50%. (Set by PID) (System pressure requirement: 0.5 Mpa)

6.2.6 PID Structure Diagram

Figure 6.2 PID Structure Diagram



7 TROUBLE SHOOTING

7.1 INVERTER MALFUNCTION CODE TABLE

Malfunction display	Malfunction code	Descriptions	Solutions
--	0	Normal	
0.CA	1	Overcurrent during acceleration	1. extend acceleration time 2. decrease load inertia 3. decrease torque boost 4. check input power 5. select start method of speed tracing
0.CD	2	Overcurrent during deceleration	1. extend deceleration time 2. decrease load inertia 3. select larger capacity inverter
0.OC	3	Overcurrent during operation	1. check input power 2. decrease load fluctuation 3. select larger capacity inverter
0.OH	4	Inverter over heat	1. check load current 2. decrease carrier frequency
0.OP	5	Over voltage	1. check input power 2. check the value of F084 3. extend deceleration time
0.UP	6	Under voltage	1. check input power 2. check the value of F084
0.OL	7	Overcurrent	1. check load current 2. select larger capacity inverter
0.CB	8	Overcurrent during DC braking	Modify the parameter of F005~F008
0.CS	9	Overcurrent inspected by software	Check current sensor
0.SE		RAM self-test malfunction	Change the main circuit board

7.2 ABNORMAL OCCURRENCE TABLE

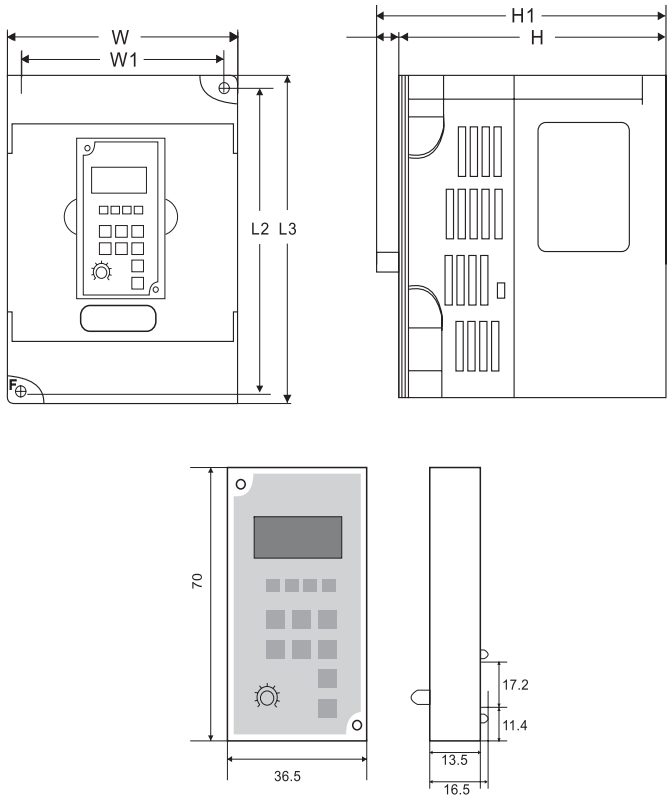
Abnormal occurrence	Possible reason	Solutions
No display when power is on	1. under voltage or lack of phase 2. DC auxiliary power malfunction 3. charging resistor is damaged	1. check input power 2. ask vendor or sales representative for help
Power trip	1. short circuit of inverter input side 2. MCCB capacity is too low	1. check wiring or ask vendor for help 2. select larger capacity MCCB
Motor not run	1. wiring error 2. operation method setting error 3. load capacity too large or motor blocked	1. check wiring 2. set the right operation method 3. select lower capacity load or modulate the motor status
Motor runs REV	Motor connection phase sequence error	Set the right connection method of U, V and W
Motor accel. /decel. not success	1. accel./decel. time setting error 2. start-point of current of stall is too low 3. carrier frequency setting error or oscillating occurs 4. load current is too large	1. set the right accel./decel. time 2. increase the value of start-point of current of stall 3. decrease carrier frequency 4. select larger capacity inverter or lower capacity load
Motor run speed fluctuation	1. load current fluctuation range is too large 2. motor overcurrent protection value too low 3. contact of potentiometer is bad	1. decrease load current fluctuation range 2. increase motor overcurrent protection value 3. replace potentiometer or ask vendor for help

Notice:

When inverter malfunction occurs, inspect the system and parameters carefully. Push " STOP RESET " to reset inverter.

APPENDIX A: INVERTER CASE AND KEYBOARD SPECIFICATION

IRON CASE



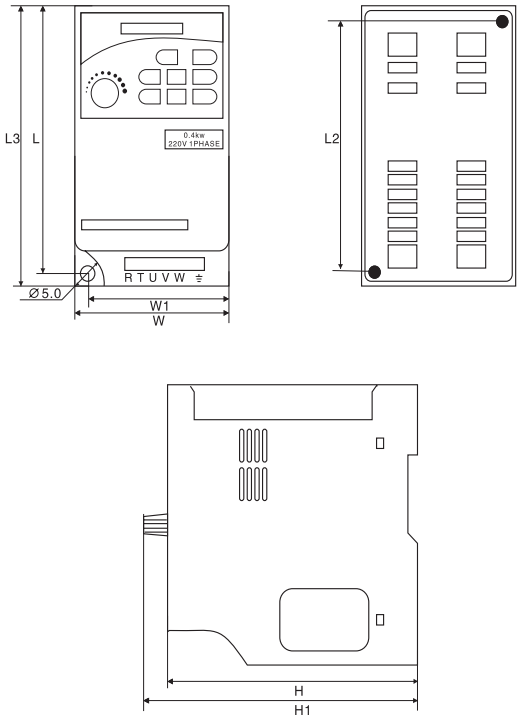
CASE SPECIFICATION TABLE OF M SERIES INVERTER

Unit:mm

Inverter type	L2	L3	W	W1	H	H1
SR40M1 S1R5M1 SR75M1 S2R2M1	140	152	105	89	117	130
SR75M3 S2R2M3 S1R5M3						

APPENDIX B: INVERTER CASE AND KEYBOARD SPECIFICATION

PLASTIC CASE



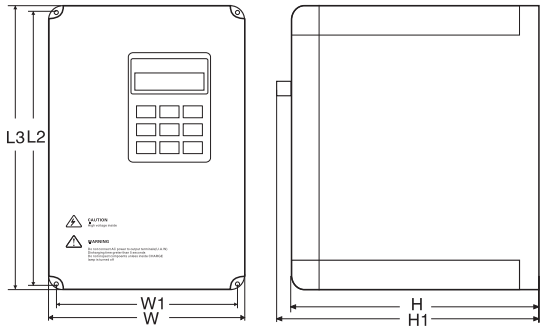
CASE SPECIFICATION TABLE OF S SERIES INVERTER

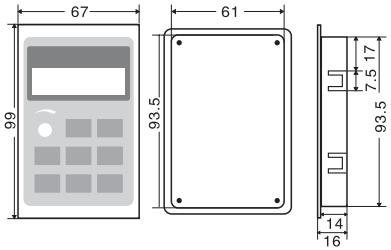
Unit:mm

Inverter type	L	L2	L3	W	W1	H	H1
SR20S1 SR75S1 SR40S1	126	120	132	68.2	61.9	122	131

APPENDIX C: INVERTER CASE AND KEYBOARD SPECIFICATION

IRON CASE





ront back side

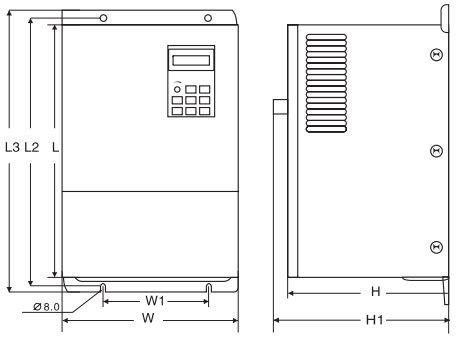
CASE SPECIFICATION TABLE OF G SERIES INVERTER

Unit:mm

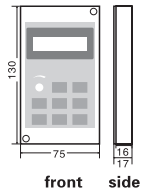
Inverter type	L	L2	L3	W	W1	H	H1
S1R5G3 S003G3 S2R2G3		159	170	126	113	145	158
S004G3 S7R5G3 S5R5G3		237	249	155	144	159	169

APPENDIX D: INVERTER CASE AND KEYBOARD SPECIFICATION

PLASTIC CASE

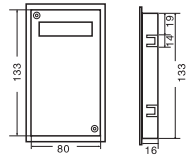


key–D



front side

key–D tray diagram



back side

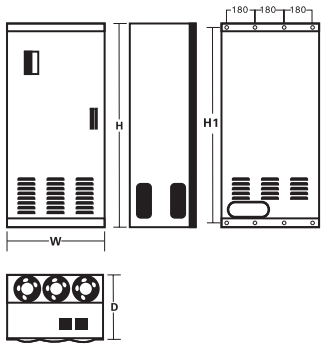
CASE SPECIFICATION TABLE OF G SERIES INVERTER

Unit:mm

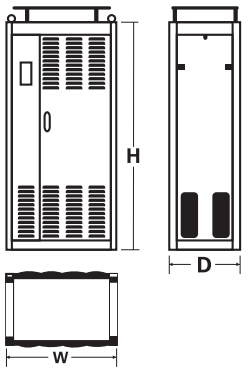
Inverter type	L	L2	L3	W	W1	H	H1
S011G3 S015G3	324	336	354	210	165	164	178
S18R5G3 S022G3	370	383	406	267	200	210	224
S030G3 S037G3	437	458	475	295	200	225	239
S045G3	500	522	535	338	253	250	260
S055G3	553	568	592	332	200	271	285
S075G3 S093G3	600	620	646	380	300	300	314
S110G3 S132G3	895	925	950	472	350	330	344

APPENDIX E: INVERTER CASE AND KEYBOARD SPECIFICATION

FOR 160kw AND ABOVE



160–185kw



200–315kw

CASE SPECIFICATION TABLE

Unit:mm

Inverter type	W	W1	H	H1	H2	D	D1	d	d1	
S160G3	600	181 (178)	1270	1230		408		12		Cabinet type
S185G3										
S200G3	**Cabinet type** 730(W)*1645(H)*470(D)									
S220G3										
S250G3										
S280G3	**Cabinet type** 850(W)*1885(H)*470(D)									
S315G3										